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Glossary

305(b)	Refers to section 305 subsection "b" of the Clean Water Act. 305(b) generally describes a report of each state's water quality, and is the principle means by which the U.S. Environmental Protection Agency, congress, and the public evaluate whether U.S. waters meet water quality standards, the progress made in maintaining and restoring water quality, and the extent of the remaining problems.
303(d)	Refers to section 303 subsection "d" of the Clean Water Act. 303(d) requires states to develop a list of water bodies that do not meet water quality standards. This section also requires total maximum daily loads (TMDLs) be prepared for listed waters. Both the list and the TMDLs are subject to U.S. Environmental Protection Agency approval.
Ambient	General conditions in the environment. In the context of water quality, ambient waters are those representative of general conditions, not associated with episodic perturbations, or specific disturbances such as a wastewater outfall (Armantrout 1998, EPA 1996).
Aquatic	Occurring, growing, or living in water.
Assemblage (aquatic)	An association of interacting populations of organisms in a given waterbody; for example, a fish assemblage, or a benthic macroinvertebrate assemblage (also see Community) (EPA 1996).
Bedload	Material (generally sand-sized or larger sediment) that is carried along the streambed by rolling or bouncing.
Beneficial Use	Any of the various uses of water, including, but not limited to, aquatic life, recreation, water supply, wildlife habitat, and aesthetics, which are recognized in water quality standards.
Beneficial Use Reconnaissance Program (BURP)	A program for conducting systematic biological and physical habitat surveys of water bodies in Idaho. BURP protocols address lakes, reservoirs, and wadeable streams and rivers.
Best Management Practices (BMPs)	Structural, nonstructural, and managerial techniques that are effective and practical means to control nonpoint source pollutants.
Biota	The animal and plant life of a given region.

Biotic	A term applied to the living components of an area.
Clean Water Act (CWA)	The Federal Water Pollution Control Act (Public Law 92-50, commonly known as the Clean Water Act), as last reauthorized by the Water Quality Act of 1987 (Public Law 100-4), establishes a process for states to use to develop information on, and control the quality of, the nation's water resources.
Coliform Bacteria	A group of bacteria predominantly inhabiting the intestines of humans and animals but also found in soil. Coliform bacteria are commonly used as indicators of the possible presence of bacterial organisms (also see Fecal Coliform Bacteria).
Community	A group of interacting organisms living together in a given place.
Criteria	In the context of water quality, numeric or descriptive factors taken into account in setting standards for various pollutants. These factors are used to determine limits on allowable concentration levels, and to limit the number of violations per year. The U.S. Environmental Protection Agency develops criteria guidance; states establish criteria.
Cubic Feet per Second	A unit of measure for the rate of flow or discharge of water. One cubic foot per second is the rate of flow of a stream with a cross-section of one square foot flowing at a mean velocity of one foot per second. At a steady rate, once cubic foot per second is equal to 448.8 gallons per minute and 10,984 acre-feet per day.
Discharge	The amount of water flowing in the stream channel at the time of measurement. Usually expressed as cubic feet per second (cfs).
Dissolved Oxygen (DO)	The oxygen dissolved in water. Adequate DO is vital to fish and other aquatic life.
Disturbance	Any event or series of events that disrupts ecosystem, community, or population structure and alters the physical environment.
E. coli	Short for *Escherichia Coli*, *E. coli* are a group of bacteria that are a subspecies of coliform bacteria. Most *E. coli* are essential to the healthy life of all warm-blooded animals, including humans. Their presence is often indicative of fecal contamination.

Endangered Species	Animals, birds, fish, plants, or other living organisms threatened with imminent extinction. Requirements for declaring a species as endangered are contained in the Endangered Species Act.
Environment	The complete range of external conditions, physical and biological, that affect a particular organism or community.
Eocene	An epoch of the early Tertiary period, after the Paleocene and before the Oligocene.
Erosion	The wearing away of areas of the earth's surface by water, wind, ice, and other forces.
Exceedance	A violation (according to DEQ policy) of the pollutant levels permitted by water quality criteria.
Existing Use	A beneficial use actually attained in waters on or after November 28, 1975, whether or not the use is designated for the waters in Idaho's *Water Quality Standards and Wastewater Treatment Requirements* (IDAPA 58.01.02).
Fauna	Animal life, especially the animals characteristic of a region, period, or special environment.
Flow	See Discharge.
Fully Supporting	In compliance with water quality standards and within the range of biological reference conditions for all designated and exiting beneficial uses as determined through the *Waterbody Assessment Guidance* (Grafe et al. 2000).
Fully Supporting Cold Water	Reliable data indicate functioning, sustainable cold water biological assemblages (e.g., fish, macroinvertebrates, or algae), none of which has been modified significantly beyond the natural range of reference conditions (EPA 1997).
Geographical Information Systems (GIS)	A georeferenced database.
Geometric Mean	A back-transformed mean of the logarithmically transformed numbers often used to describe highly variable, right-skewed data (a few large values), such as bacterial data.
Gradient	The slopes of the land, water, or streambed surface.

Ground Water	Water found beneath the soil surface saturating the layer in which it is located. Most ground water originates as rainfall, is free to move under the influence of gravity, and usually emerges again as stream flow.
Habitat	The living place of an organism or community.
Headwater	The origin or beginning of a stream.
Hydrologic Unit	One of a nested series of numbered and named watersheds arising from a national standardization of watershed delineation. The initial 1974 effort (USGS 1987) described four levels (region, subregion, accounting unit, cataloging unit) of watersheds throughout the United States. The fourth level is uniquely identified by an eight-digit code built of two-digit fields for each level in the classification. Originally termed a cataloging unit, fourth field hydrologic units have been more commonly called subbasins. Fifth and sixth field hydrologic units have since been delineated for much of the country and are known as watershed and subwatersheds, respectively.
Hydrologic Unit Code (HUC)	The number assigned to a hydrologic unit. Often used to refer to fourth field hydrologic units.
Load Allocation (LA)	A portion of a waterbody's load capacity for a given pollutant that is given to a particular nonpoint source (by class, type, or geographic area).
Load(ing)	The quantity of a substance entering a receiving stream, usually expressed in pounds or kilograms per day or tons per year. Loading is the product of flow (discharge) and concentration.
Load capacity (LC)	A determination of how much pollutant a waterbody can receive over a given period without causing violations of state water quality standards. Upon allocation to various sources, and a margin of safety, it becomes a total maximum daily load.
Loam	Refers to a soil with a texture resulting from a relative balance of sand, silt, and clay. This balance imparts many desirable characteristics for agricultural use.
Macroinvertebrate	An invertebrate animal (without a backbone) large enough to be seen without magnification and retained by a 500µm mesh (U.S. #30) screen.

Margin of Safety (MOS) — An implicit or explicit portion of a waterbody's load capacity set aside to allow the uncertainly about the relationship between the pollutant loads and the quality of the receiving waterbody. This is a required component of a total maximum daily load (TMDL) and is often incorporated into conservative assumptions used to develop the TMDL (generally within the calculations and/or models). The MOS is not allocated to any sources of pollution.

Mass Wasting — A general term for the down slope movement of soil and rock material under the direct influence of gravity.

Mean — Describes the central tendency of a set of numbers. The arithmetic mean (calculated by adding all items in a list, then dividing by the number of items) is the statistic most familiar to most people.

Median — The middle number in a sequence of numbers. If there are an even number of numbers, the median is the average of the two middle numbers. For example, 4 is the median of 1, 2, 4, 14, 16; and 6 is the median of 1, 2, 5, 7, 9, 11.

Metric — 1) A discrete measure of something, such as an ecological indicator (e.g., number of distinct taxon). 2) The metric system of measurement.

Milligrams per Liter (mg/L) — A unit of measure for concentration in water, essentially equivalent to parts per million (ppm).

Million Gallons per Day (MGD) — A unit of measure for the rate of discharge of water, often used to measure flow at wastewater treatment plants. One MGD is equal to 1.547 cubic feet per second.

Miocene — Of, relating to, or being an epoch of, the Tertiary between the Pliocene and the Oligocene periods, or the corresponding system of rocks.

Monitoring — A periodic or continuous measurement of the properties or conditions of some medium of interest, such as monitoring a waterbody.

Mouth — The location where flowing water enters into a larger waterbody.

National Pollution Discharge Elimination System (NPDES) — A national program established by the Clean Water Act for permitting point sources of pollution. Discharge of pollution from point sources is not allowed without a permit.

Natural Condition A condition indistinguishable from that without human-caused disruptions.

Nonpoint Source A dispersed source of pollutants generated from a geographical area when pollutants are dissolved or suspended in runoff and then delivered into waters of the state. Nonpoint sources are without a discernable point or origin. They include, but are not limited to, irrigated and non-irrigated lands used for grazing, crop production, and silviculture; rural roads; construction and mining sites; log storage or rafting; and recreation sites.

Not Attainable A concept and an assessment category describing water bodies that demonstrate characteristics that make it unlikely that a beneficial use can be attained (e.g., a stream that is dry but designated for salmonid spawning).

Parameter A variable, measurable property whose value is a determinant of the characteristics of a system; e.g., temperature, dissolved oxygen, and fish populations are parameters of a stream or lake.

pH The negative $\log_{10}$ of the concentration of hydrogen ions, a measure which in water ranges from very acid (pH=1) to very alkaline (pH=14). A pH of 7 is neutral. Surface waters usually measure between pH 6 and 9.

Point Source A source of pollutants characterized by having a discrete conveyance, such as a pipe, ditch, or other identifiable "point" of discharge into a receiving water. Common point sources of pollution are industrial and municipal wastewater.

Pollutant Generally, any substance introduced into the environment that adversely affects the usefulness of a resource or the health of humans, animals, or ecosystems.

Pollution A very broad concept that encompasses human-caused changes in the environment which alter the functioning of natural processes and produce undesirable environmental and health effects. This includes human-induced alteration of the physical, biological, chemical, and radiological integrity of water and other media.

Population A group of interbreeding organisms occupying a particular space; the number of humans or other living creatures in a designated area.

Protocol A series of formal steps for conducting a test or survey.

Quantitative Descriptive of size, magnitude, or degree.

Reach A stream section with fairly homogenous physical characteristics.

Reconnaissance An exploratory or preliminary survey of an area.

Reference A physical or chemical quantity whose value is known, and thus is used to calibrate or standardize instruments.

Reference Condition 1) A condition that fully supports applicable beneficial uses with little affect from human activity and represents the highest level of support attainable. 2) A benchmark for populations of aquatic ecosystems used to describe desired conditions in a biological assessment and acceptable or unacceptable departures from them. The reference condition can be determined through examining regional reference sites, historical conditions, quantitative models, and expert judgment (Hughes 1995).

Reference Site A specific locality on a waterbody that is minimally impaired and is representative of reference conditions for similar water bodies.

Resident A term that describes fish that do not migrate.

Riffle A relatively shallow, gravelly area of a streambed with a locally fast current, recognized by surface choppiness. Also an area of higher streambed gradient and roughness.

Riparian Associated with aquatic (stream, river, lake) habitats. Living or located on the bank of a waterbody.

River A large, natural, or human-modified stream that flows in a defined course or channel, or a series of diverging and converging channels.

Runoff The portion of rainfall, melted snow, or irrigation water that flows across the surface, through shallow underground zones (interflow), and through ground water to creates streams.

Sediments Deposits of fragmented materials from weathered rocks and organic material that were suspended in, transported by, and eventually deposited by water or air.

Species	1) A reproductively isolated aggregate of interbreeding organisms having common attributes and usually designated by a common name. 2) An organism belonging to such a category.
Stream	A natural watercourse containing flowing water, part of the year. Together with dissolved and suspended materials, a stream normally supports communities of plants and animals within the channel and the riparian vegetation zone.
Stream Order	Hierarchical ordering of streams based on the degree of branching. A first-order stream is an unforked or unbranched stream. Under Strahler's (1957) system, higher order streams result from the joining of two streams of the same order.
Subbasin	A large watershed of several hundred thousand acres. This is the name commonly given to 4th field hydrologic units (also see Hydrologic Unit).
Subbasin Assessment (SBA)	A watershed-based problem assessment that is the first step in developing a total maximum daily load in Idaho.
Subwatershed	A smaller watershed area delineated within a larger watershed, often for purposes of describing and managing localized conditions. Also proposed for adoption as the formal name for 6th field hydrologic units.
Surface Water	All water naturally open to the atmosphere (rivers, lakes, reservoirs, streams, impoundments, seas, estuaries, etc.) and all springs, wells, or other collectors that are directly influenced by surface water.
Total Maximum Daily Load (TMDL)	A TMDL is a waterbody's load capacity after it has been allocated among pollutant sources. It can be expressed on a time basis other than daily if appropriate. Sediment loads, for example, are often calculated on an annual basis. TMDL = Load capacity = Load Allocation + Wasteload Allocation + Margin of Safety. In common usage, a TMDL also refers to the written document that contains the statement of loads and supporting analyses, often incorporating TMDLs for several water bodies and/or pollutants within a given watershed.
Total Suspended Solids (TSS)	The dry weight of material retained on a filter after filtration. Filter pore size and drying temperature can vary. American Public Health Association Standard Methods (Greenborg, Clescevi, and Eaton 1992) call for using a filter of 2.0 micron or smaller; a 0.45 micron filter is also often used. This method calls for drying at a temperature of 103-105 °C.

Tributary	A stream feeding into a larger stream or lake.
Turbidity	A measure of the extent to which light passing through water is scattered by fine suspended materials. The effect of turbidity depends on the size of the particles (the finer the particles, the greater the effect per unit weight) and the color of the particles.
Wasteload Allocation (WLA)	The portion of receiving water's load capacity that is allocated to one of its existing or future point sources of pollution. Wasteload allocations specify how much pollutant each point source may release to a waterbody.
Waterbody	A stream, river, lake, estuary, coastline, or other water feature, or portion thereof.
Water Column	Water between the interface with the air at the surface and the interface with the sediment layer at the bottom. The idea derives from a vertical series of measurements (oxygen, temperature, phosphorus) used to characterize water.
Water Pollution	Any alteration of the physical, thermal, chemical, biological, or radioactive properties of any waters of the state, or the discharge of any pollutant into the waters of the state, which will or is likely to create a nuisance or to render such waters harmful, detrimental, or injurious to public health, safety, or welfare; to fish and wildlife; or to domestic, commercial, industrial, recreational, aesthetic, or other beneficial uses.
Water Quality	A term used to describe the biological, chemical, and physical characteristics of water with respect to its suitability for a beneficial use.
Water Quality Criteria	Levels of water quality expected to render a body of water suitable for its designated uses. Criteria are based on specific levels of pollutants that would make the water harmful if used for drinking, swimming, farming, or industrial processes.
Water Quality Limited	A label that describes water bodies for which one or more water quality criterion is not met or beneficial uses are not fully supported. Water quality limited segments may or may not be on a 303(d) list.

Water Quality Limited Segment (WQLS) Any segment placed on a state's 303(d) list for failure to meet applicable water quality standards, and/or is not expected to meet applicable water quality standards in the period prior to the next list. These segments are also referred to as "303(d) listed."

Water Quality Standards State-adopted and U.S. Environmental Protection Agency-approved ambient standards for water bodies. The standards prescribe the use of the waterbody and establish the water quality criteria that must be met to protect designated uses.

Watershed 1) All the land which contributes runoff to a common point in a drainage network, or to a lake outlet. Watersheds are infinitely nested, and any large watershed is composed of smaller "subwatersheds." 2) The whole geographic region which contributes water to a point of interest in a waterbody.

Wetland An area that is at least some of the time saturated by surface or ground water so as to support with vegetation adapted to saturated soil conditions. Examples include swamps, bogs, fens, and marshes.

Appendix A

Unit Conversions Chart

Appendix A

Unit Conversions Chart

Appendix A. Unit Conversions Chart

	English Units	Metric Units	To Convert	Example
Distance	Miles (mi)	Kilometers (km)	1 mi = 1.61 km 1 km = 0.62 mi	3 mi = 4.83 km 3 km = 1.86 mi
Length	Inches (in) Feet (ft)	Centimeters (cm) Meters (m)	1 in = 2.54 cm 1 cm = 0.39 in 1 ft = 0.30 m 1 m = 3.28 ft	3 in = 7.62 cm 3 cm = 1.18 in 3 ft = 0.91 m 3 m = 9.84 ft
Area	Acres (ac) Square Feet (ft^2) Square Miles (mi^2)	Hectares (ha) Square Meters (m^2) Square Kilometers (km^2)	1 ac = 0.40 ha 1 ha = 2.47 ac 1 ft^2 = 0.09 m^2 1 m^2 = 10.76 ft^2 1 mi^2 = 2.59 km^2 1 km^2 = 0.39 mi^2	3 ac = 1.20 ha 3 ha = 7.41 ac 3 ft^2 = 0.28 m^2 3 m^2 = 32.29 ft^2 3 mi^2 = 7.77 km^2 3 km^2 = 1.16 mi^2
Volume	Gallons (g) Cubic Feet (ft^3)	Liters (L) Cubic Meters (m^3)	1 g = 3.78 l 1 l = 0.26 g 1 ft^3 = 0.03 m^3 1 m^3 = 35.32 ft^3	3 g = 11.35 l 3 l = 0.79 g 3 ft^3 = 0.09 m^3 3 m^3 = 105.94 ft^3
Flow Rate	Cubic Feet per Second (ft^3/sec)[1]	Cubic Meters per Second (m^3/sec)	1 ft^3/sec = 0.03 m^3/sec 1 m^3/sec = ft^3/sec	3 ft^3/sec = 0.09 m^3/sec 3 m^3/sec = 105.94 ft^3/sec
Concentration	Parts per Million (ppm)	Milligrams per Liter (mg/L)	1 ppm = 1 mg/L[2]	3 ppm = 3 mg/L
Weight	Pounds (lbs)	Kilograms (kg)	1 lb = 0.45 kg 1 kg = 2.20 lbs	3 lb = 1.36 kg 3 kg = 6.61 kg
Temperature	Fahrenheit (°F)	Celsius (°C)	°C = 0.55 (F - 32) °F = (C x 1.8) + 32	3 °F = -15.95 °C 3 ° C = 37.4 °F

[1] 1 ft^3/sec = 0.65 million gallons per day; 1 million gallons per day is equal to 1.55 ft^3/sec.
[2]The ratio of 1 ppm = 1 mg/L is approximate and is only accurate for water.

Appendix B

Water Quality Data

Appendix B. Water Quality Data

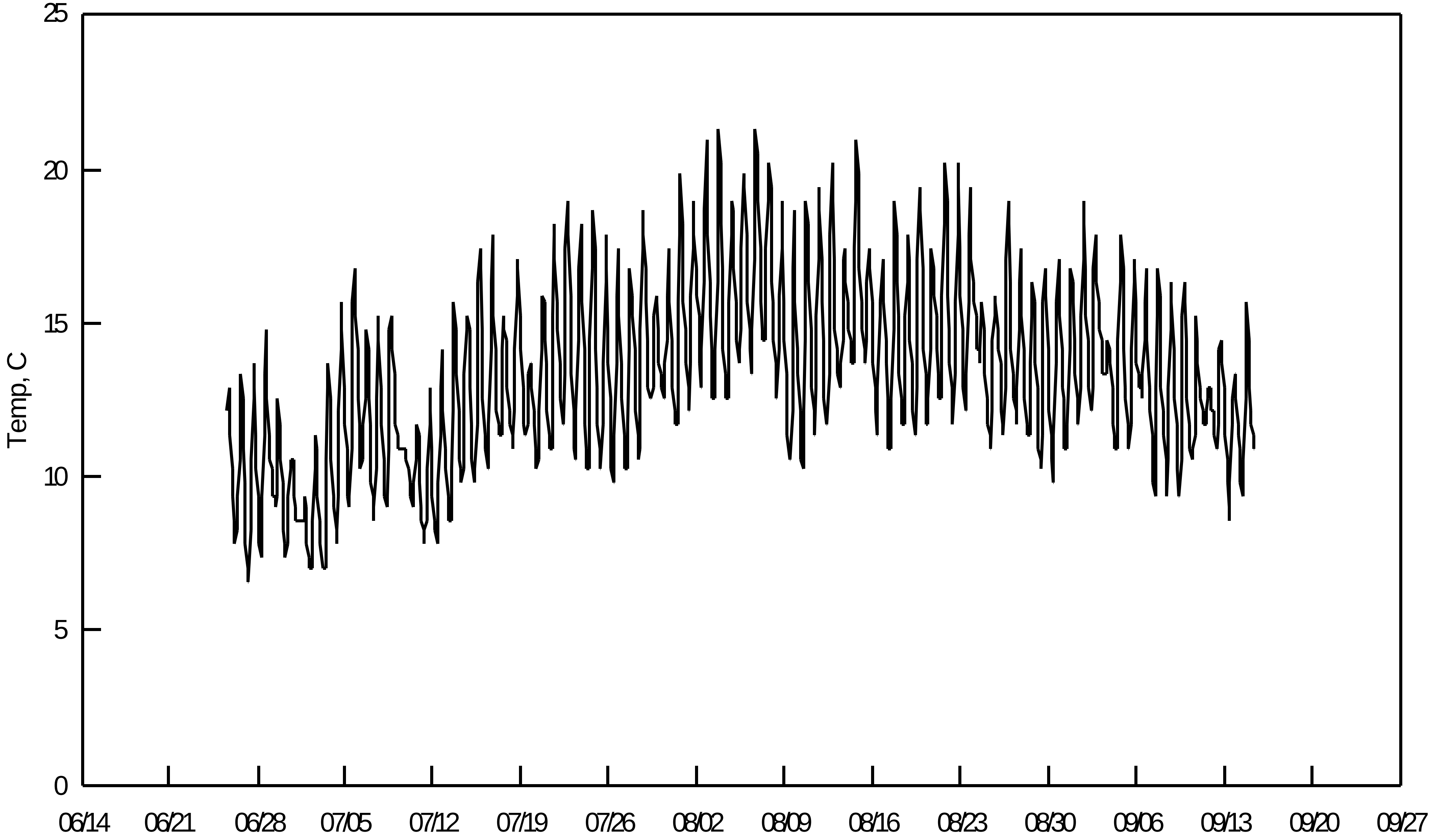

Figure B-1. Middle Fork of the St. Maries River Temperature Profile, Summer 1997

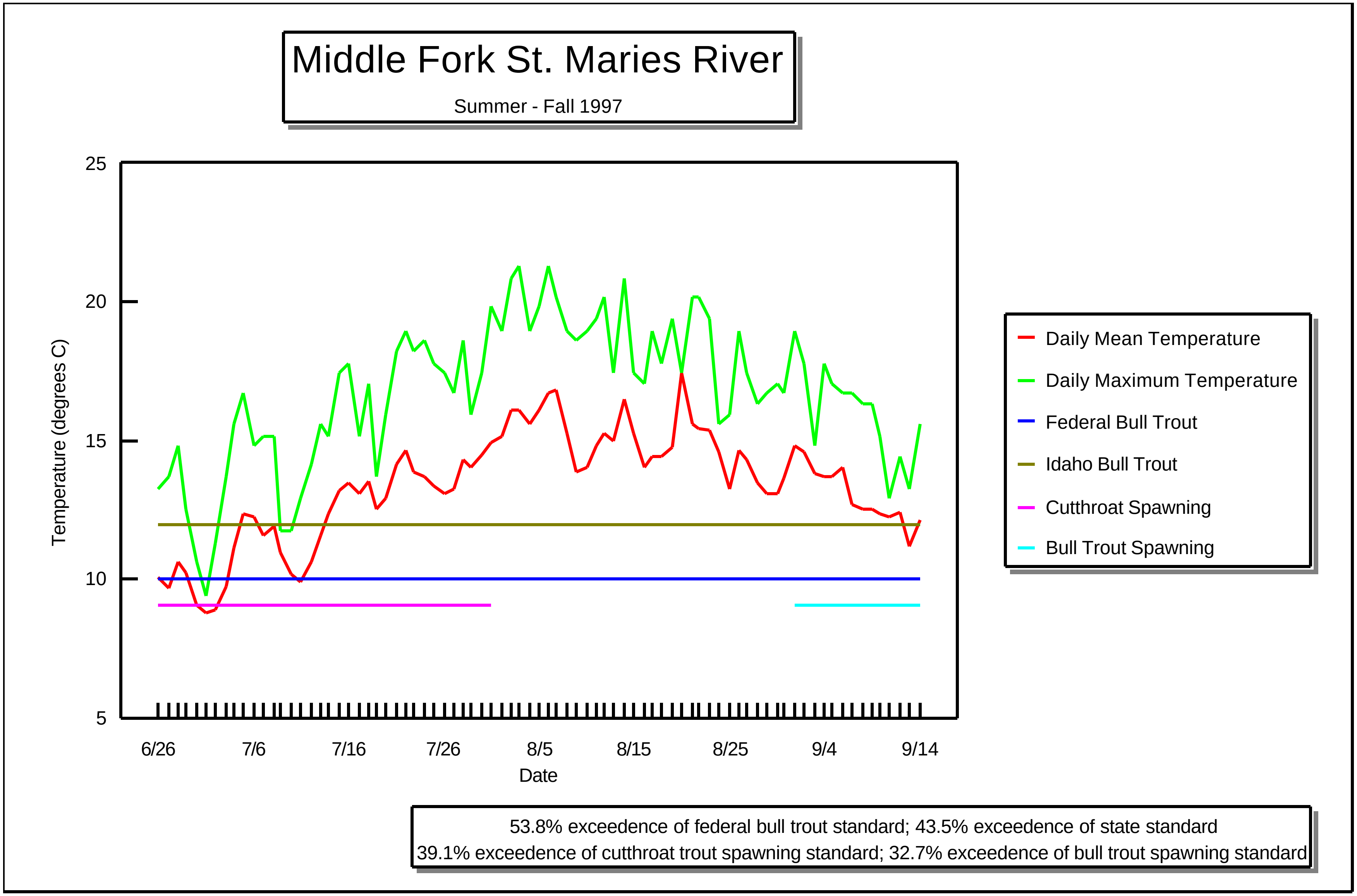

Figure B-2. Middle Fork of the St. Maries River Water Temperature Analysis, 1997

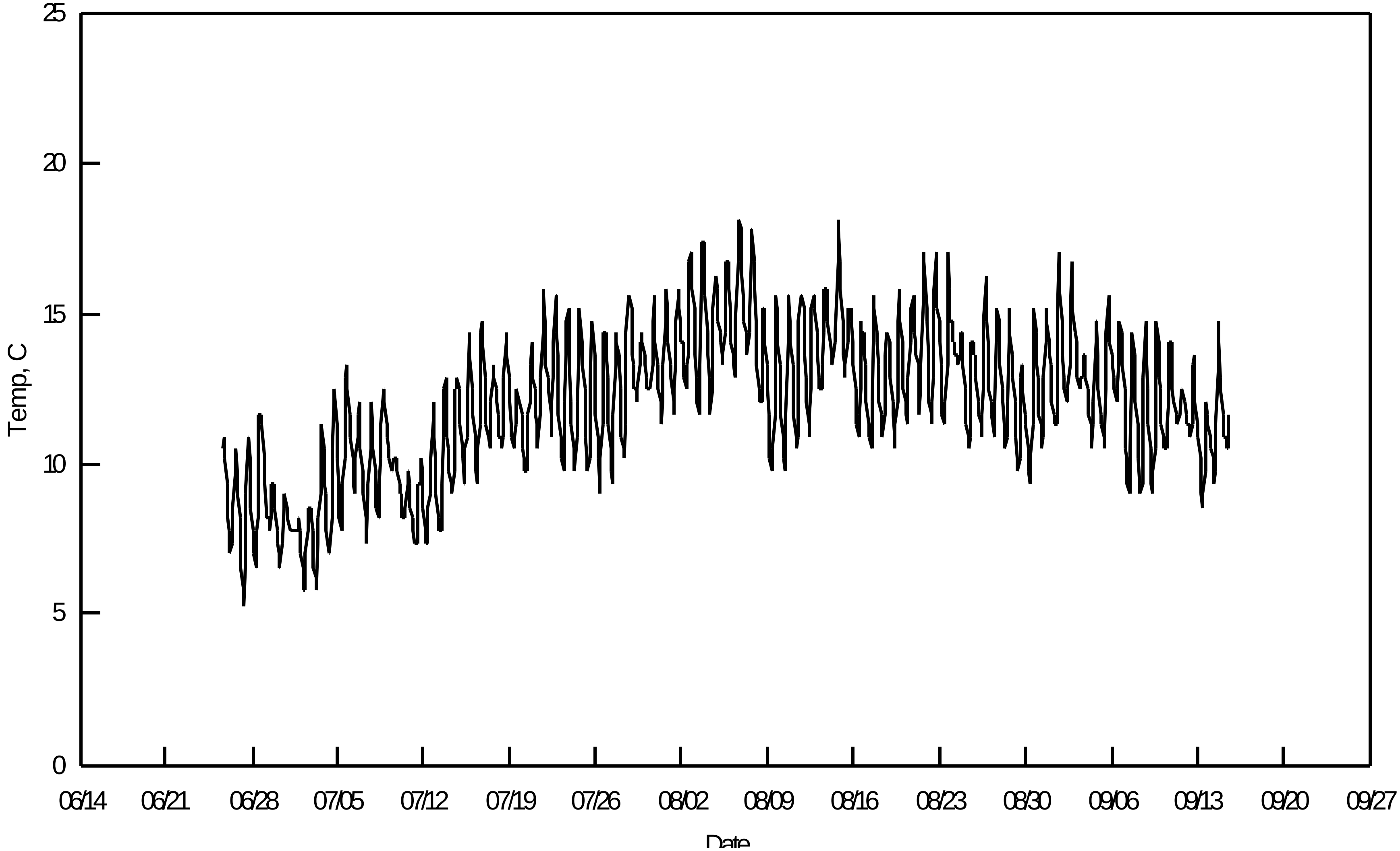

Figure B-3. Gramp Creek Temperature Profile, Summer 1997

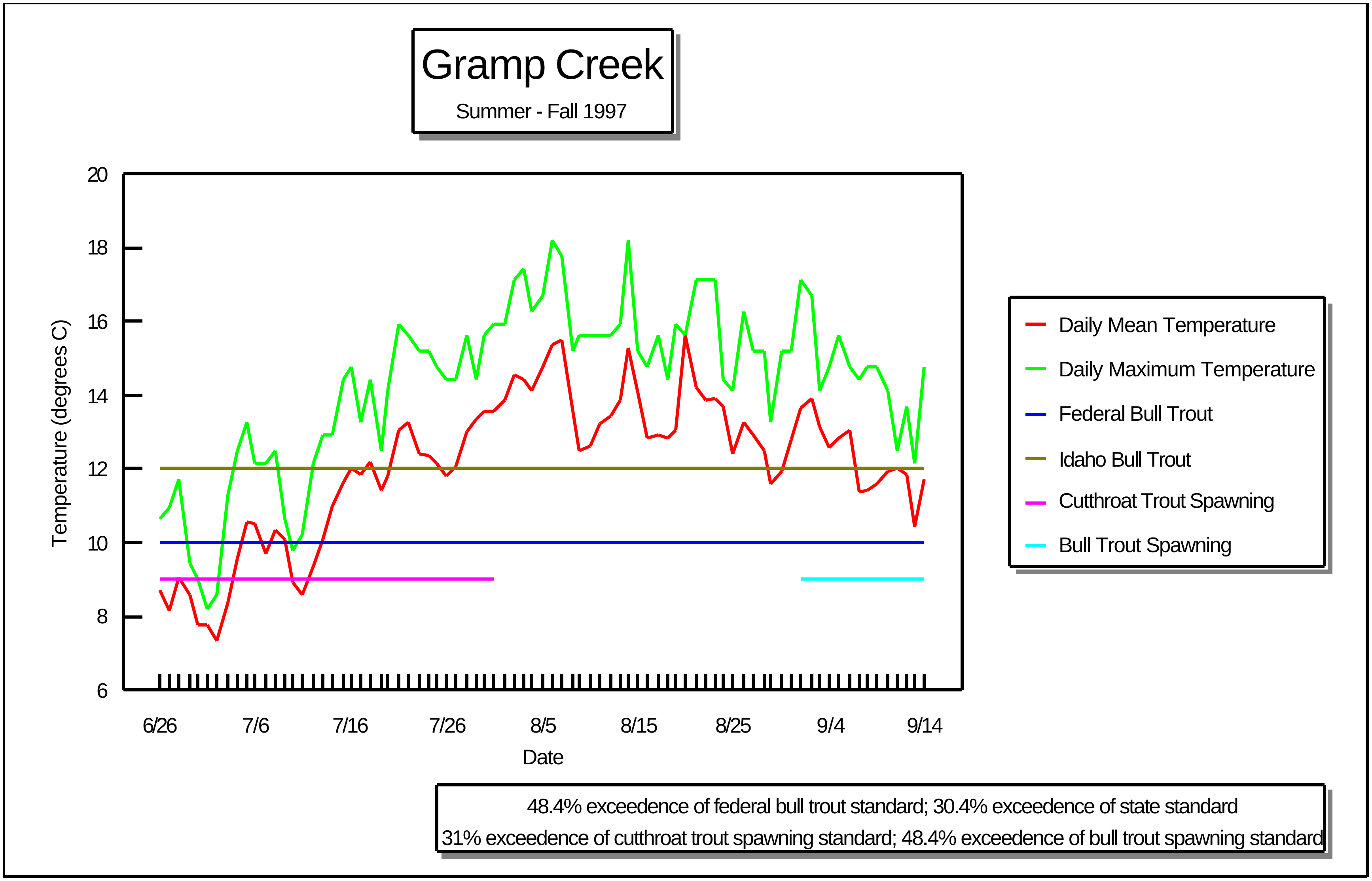

Figure B-4. Gramp Creek Water Temperature Analysis, 1997

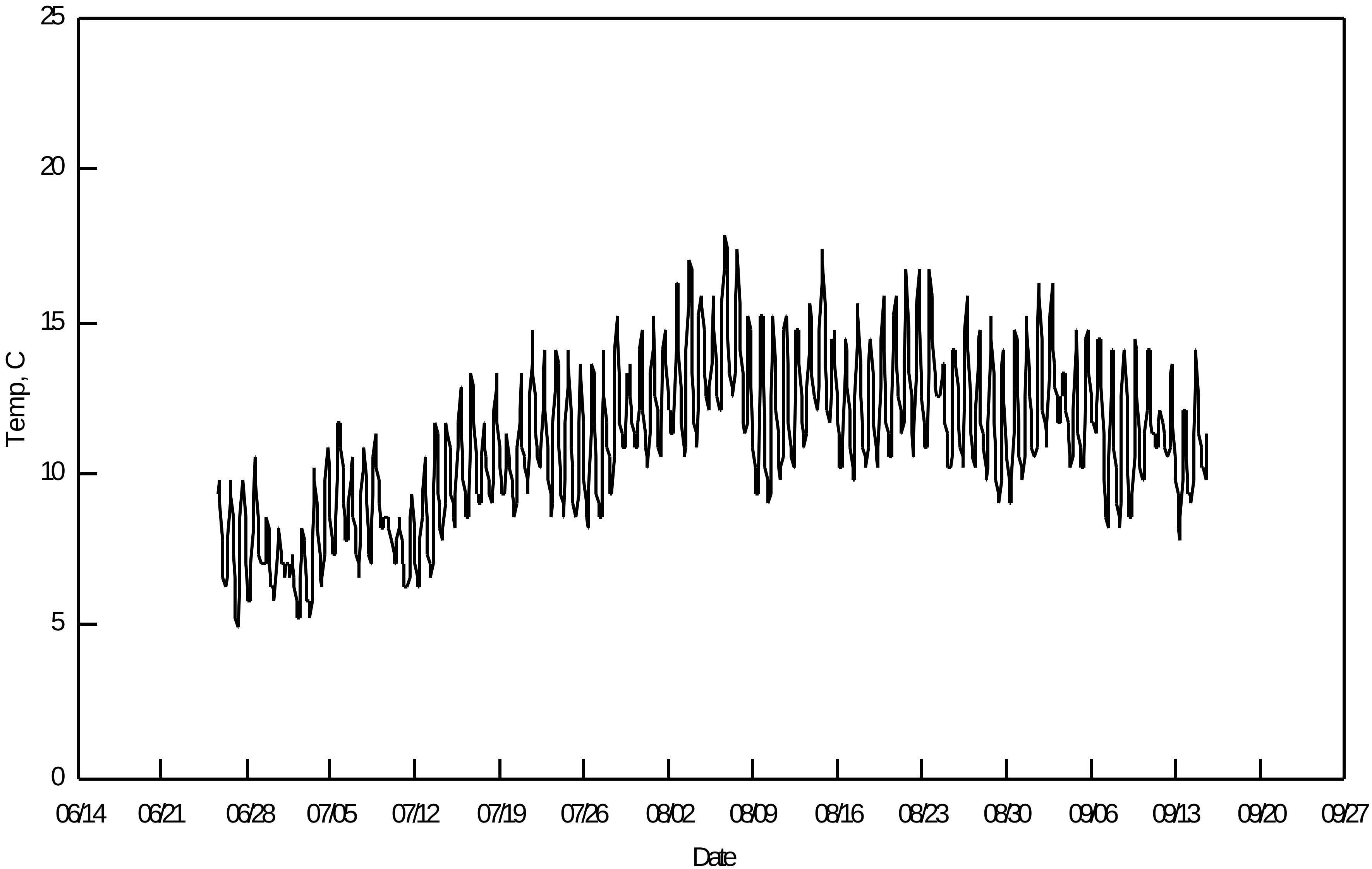

Figure B-5. Gold Center Creek Temperature Profile, Summer 1997

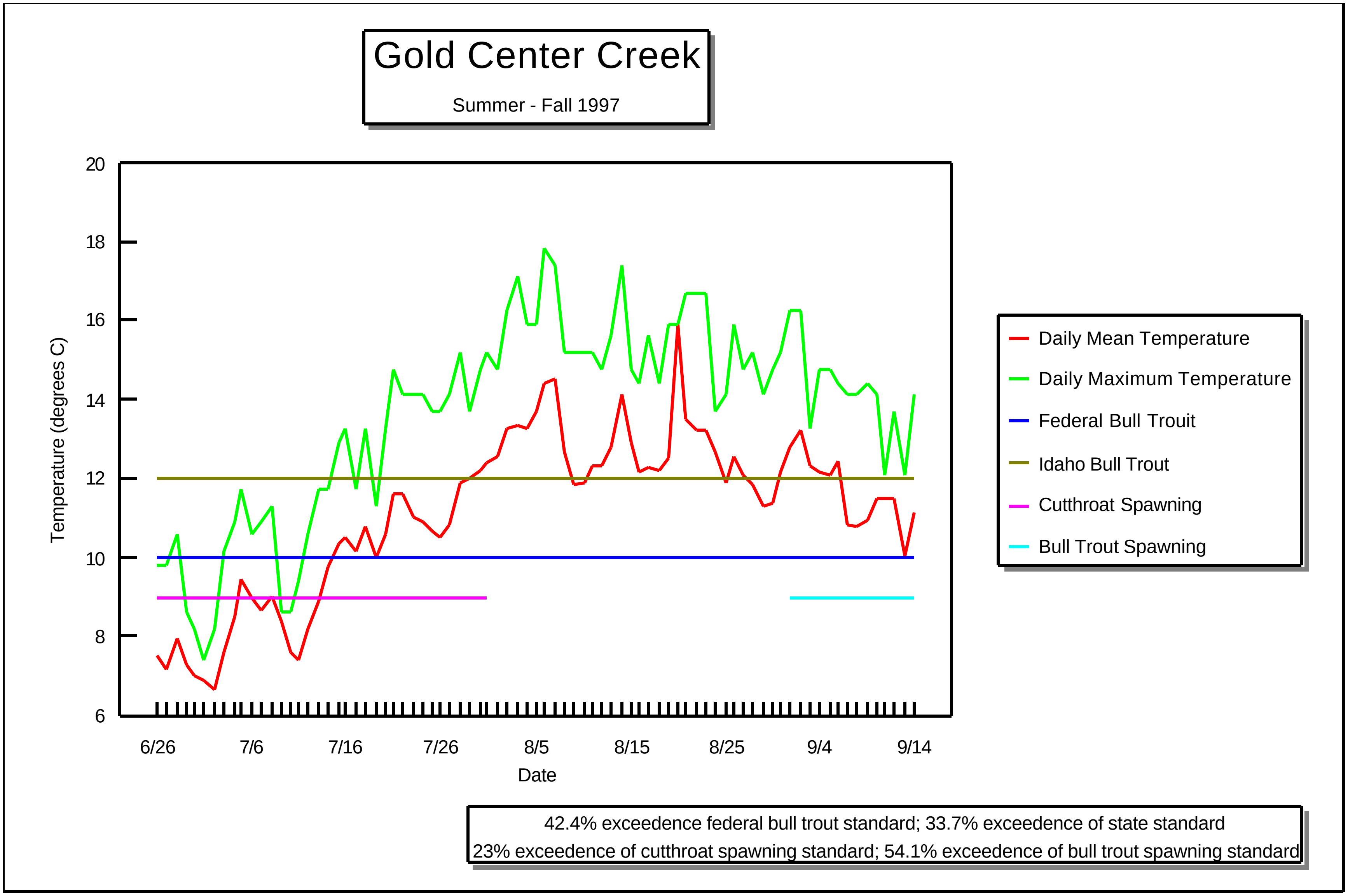

Figure B-6. Gold Center Creek Water Temperature Analysis, 1997

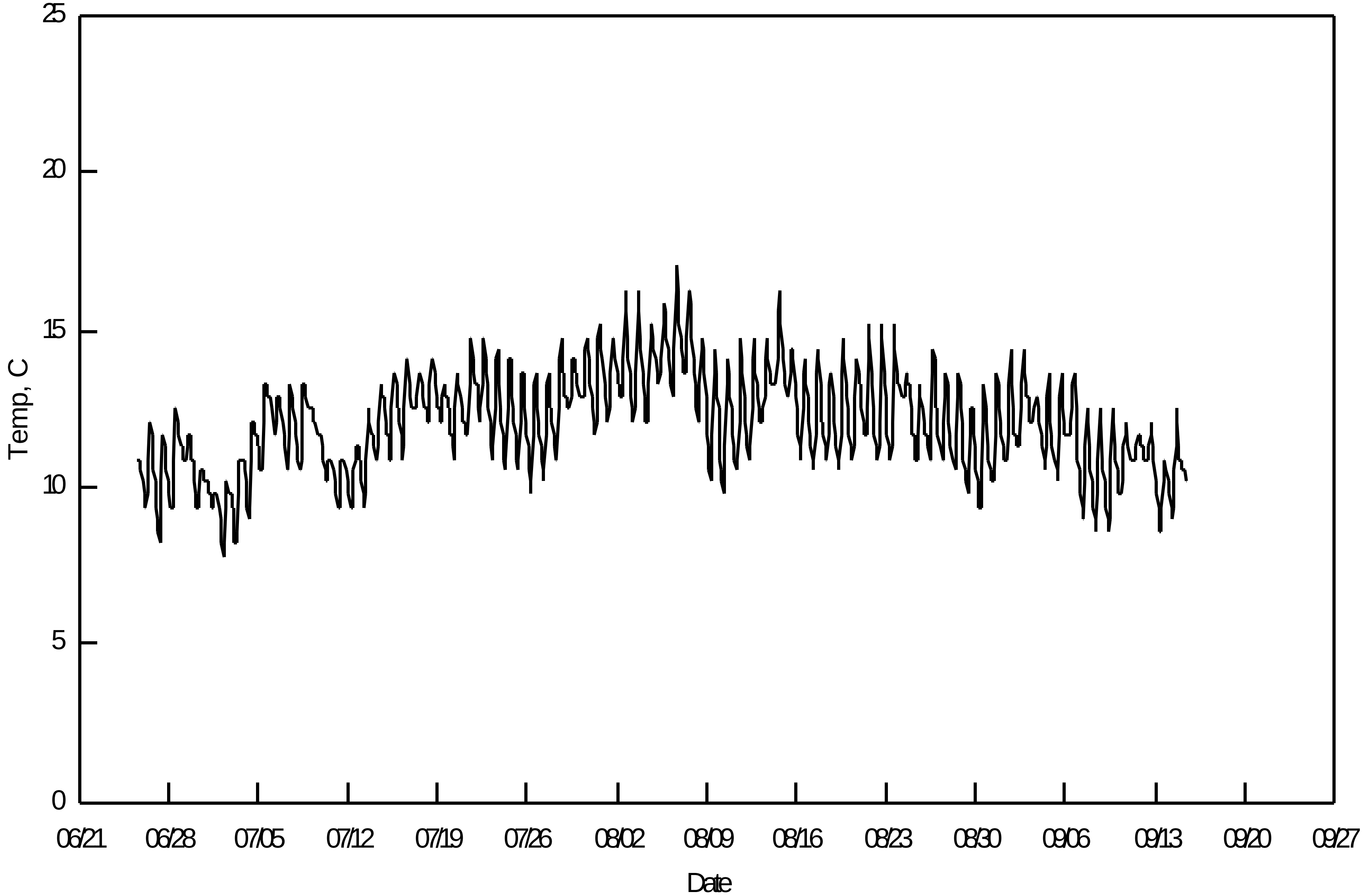

Figure B-7. Flewsie Creek Temperature Profile, Summer 1997

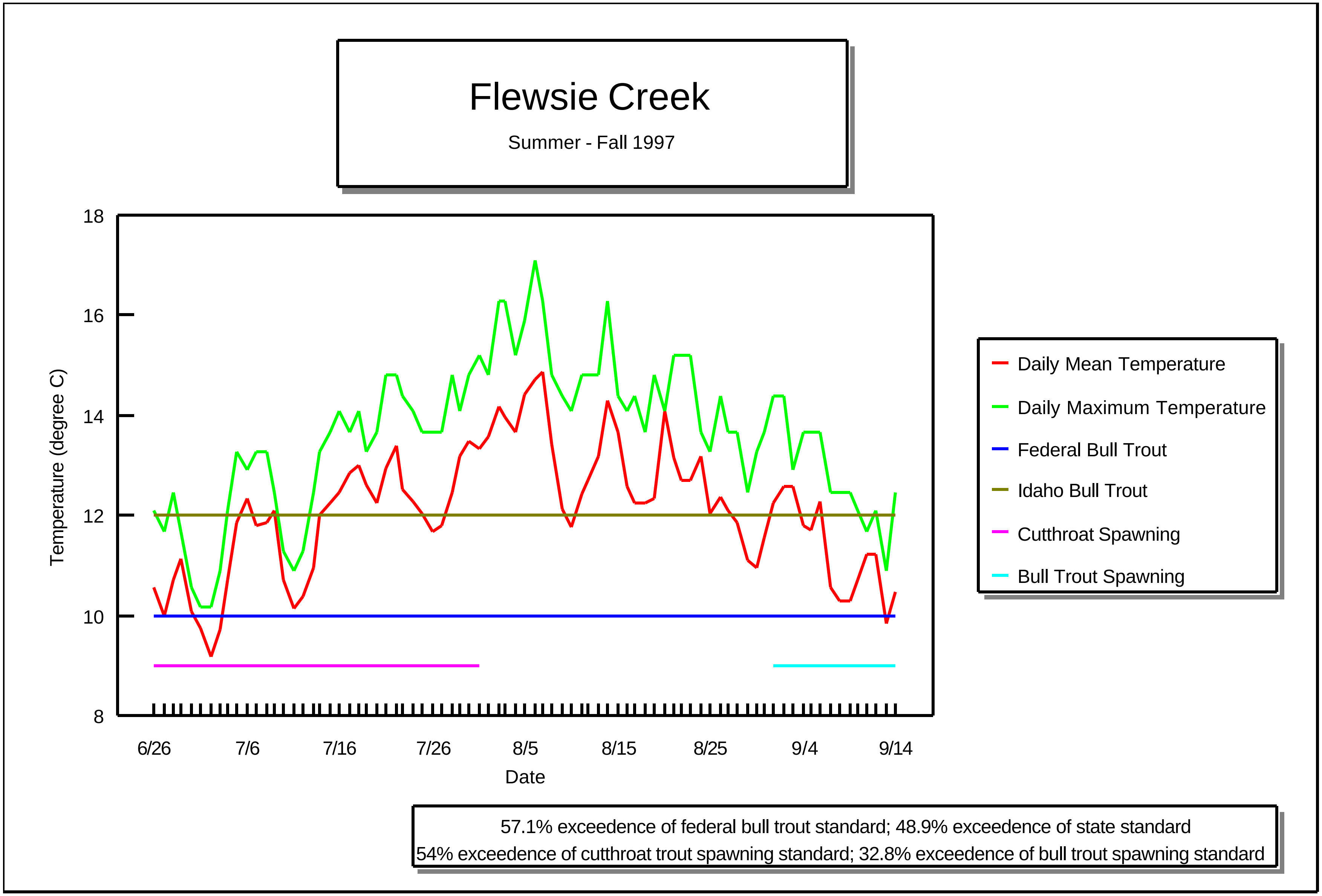

Figure B-8. Flewsie Creek Water Temperature Analysis, 1997

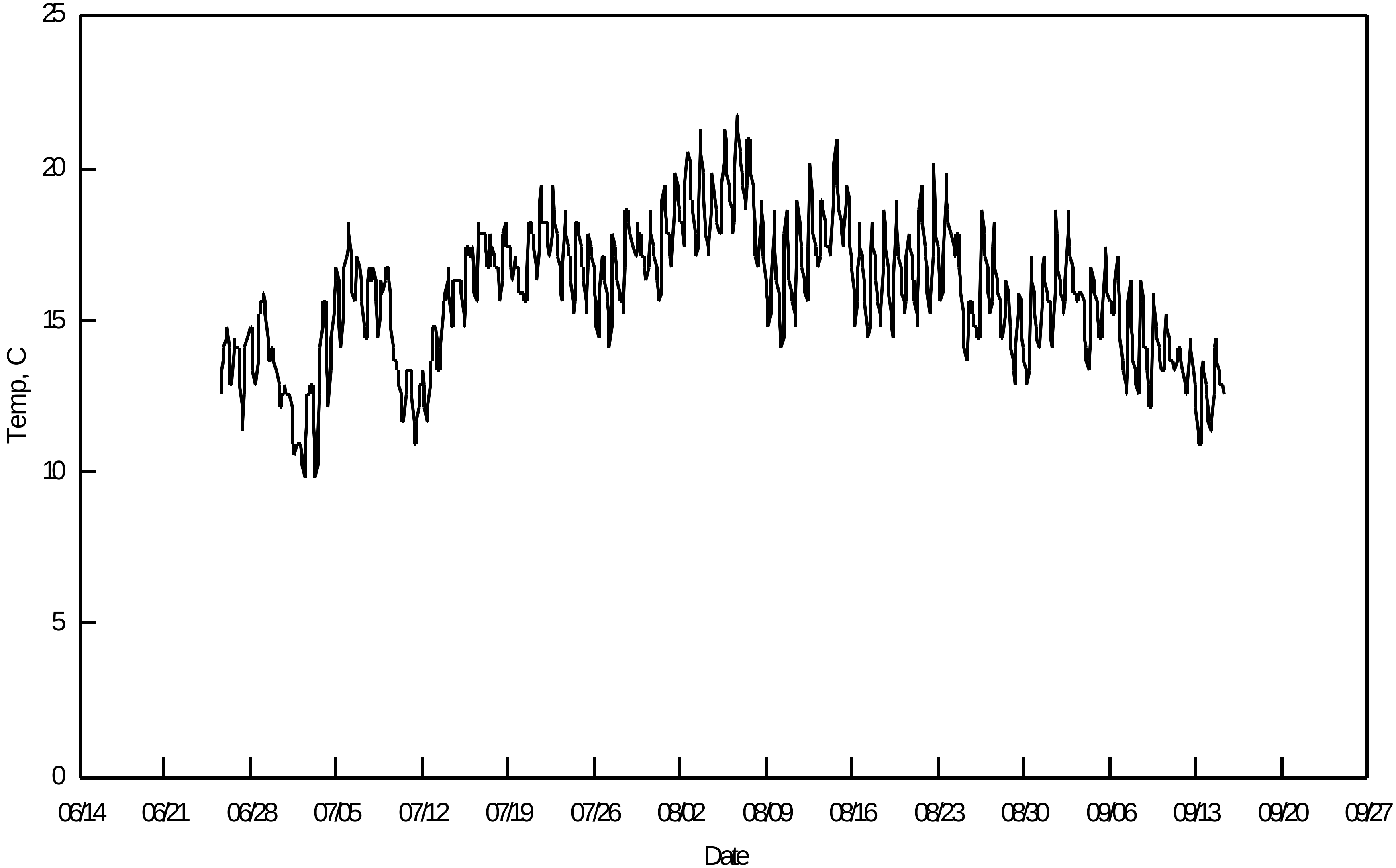

Figure B-9. Emerald Creek - 1 Temperature Profile, Summer 1997

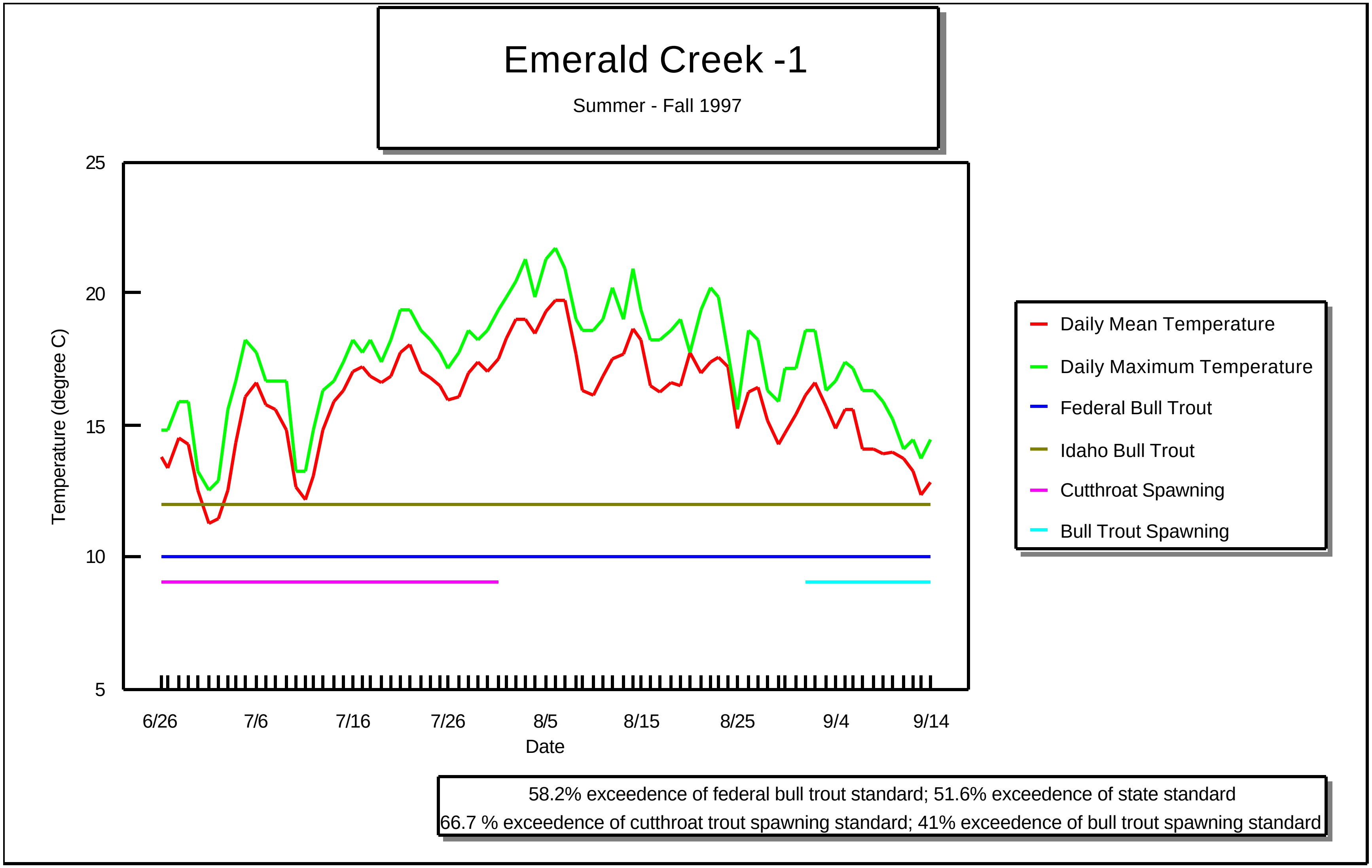

Figure B-10. Emerald Creek – 1 Water Temperature Analysis, 1997

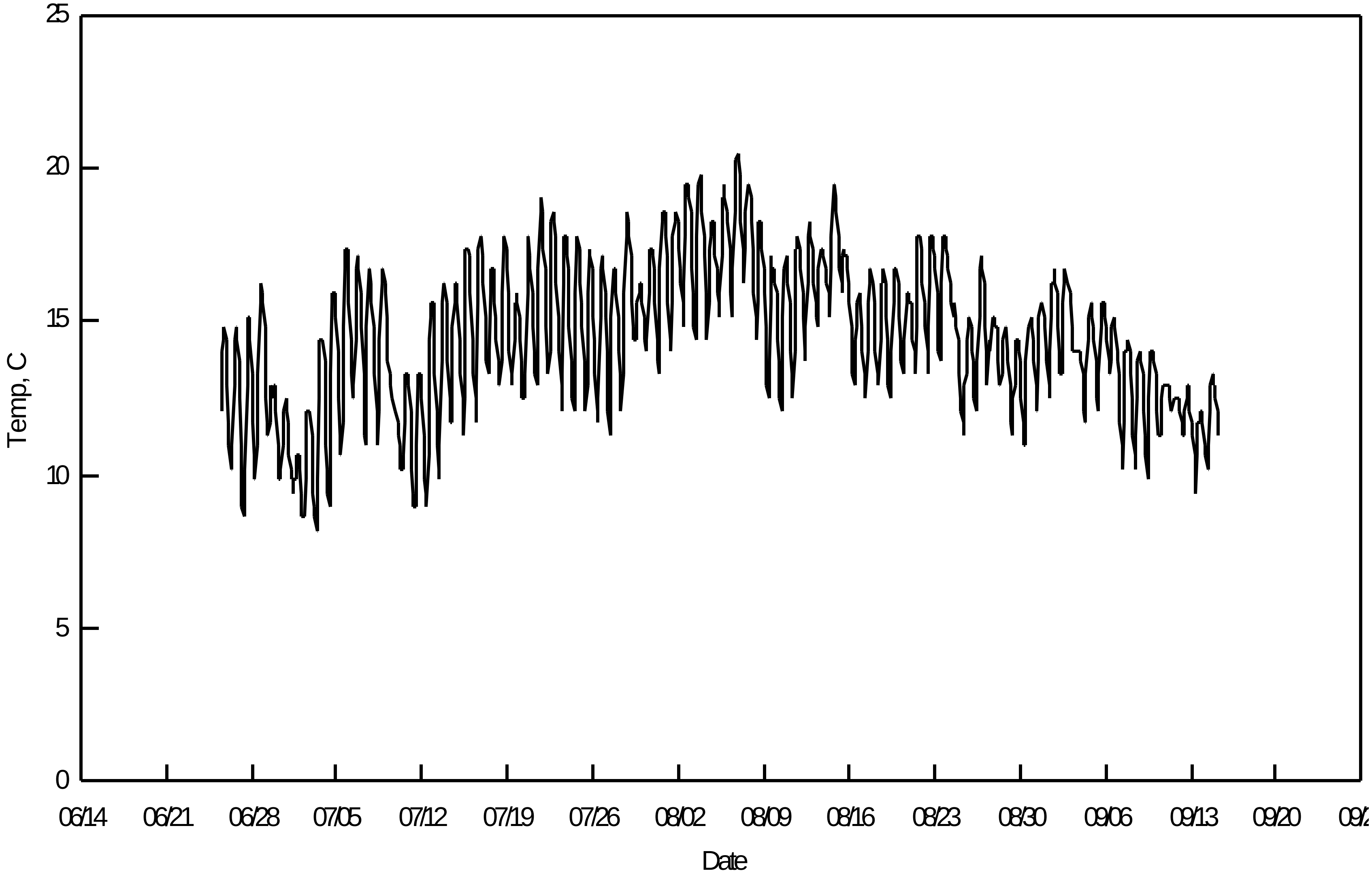

Figure B-11. Emerald Creek - 2 Temperature Profile, Summer 1997

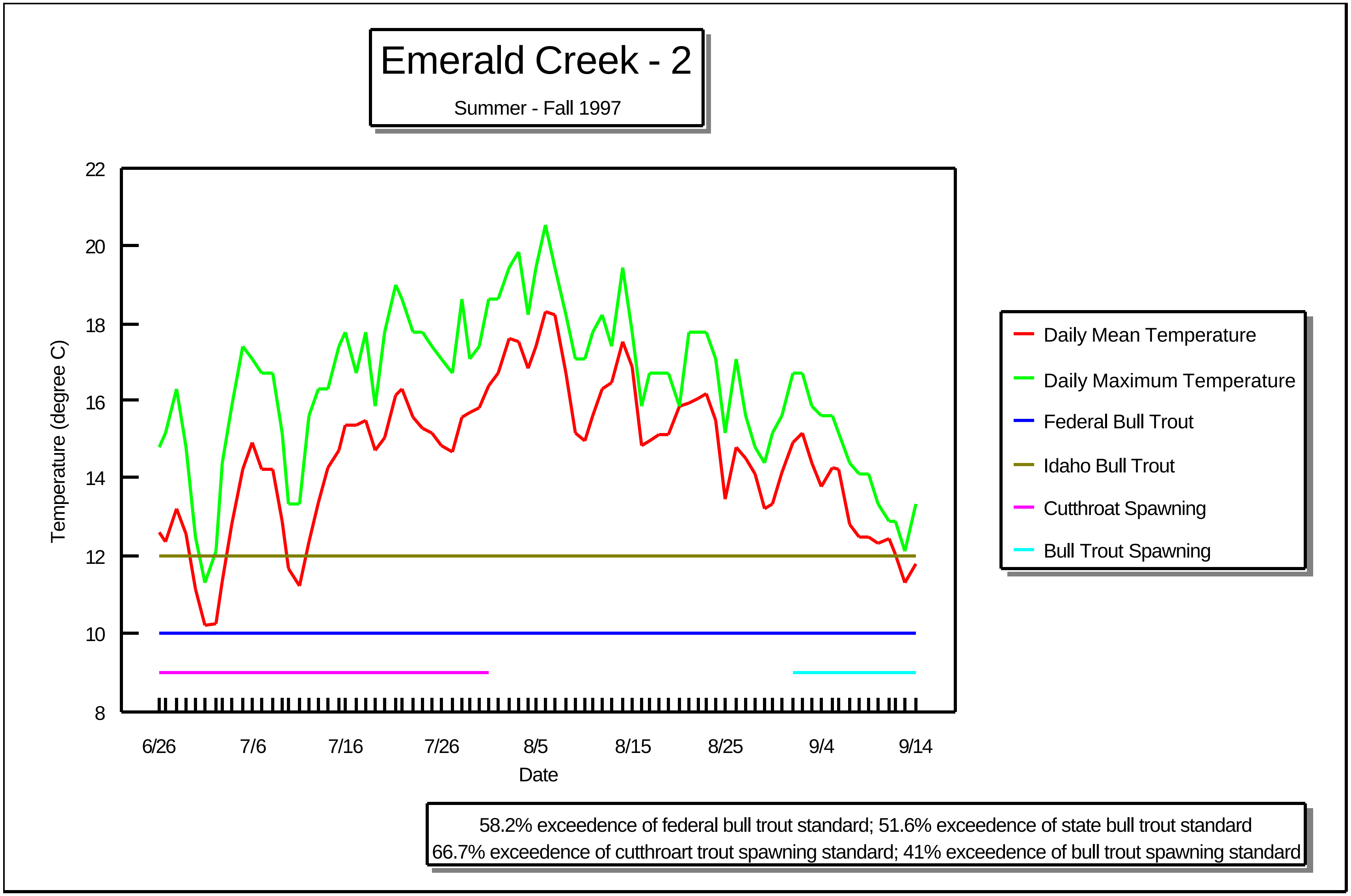

Figure B-12. Emerald Creek – 2 Water Temperature Analysis, 1997

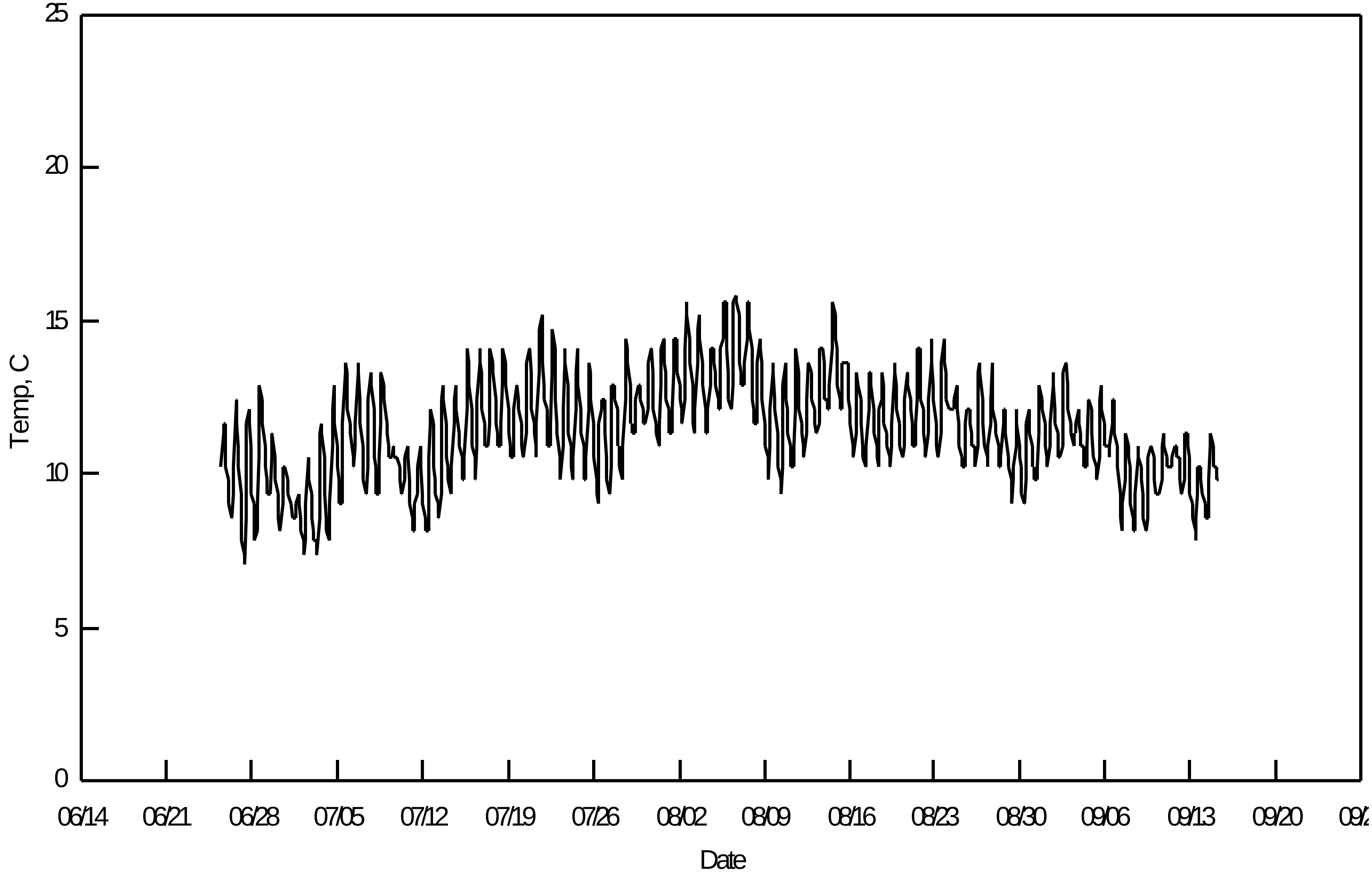

Figure B-13. Emerald Creek - 3 Temperature Profile, Summer 1997

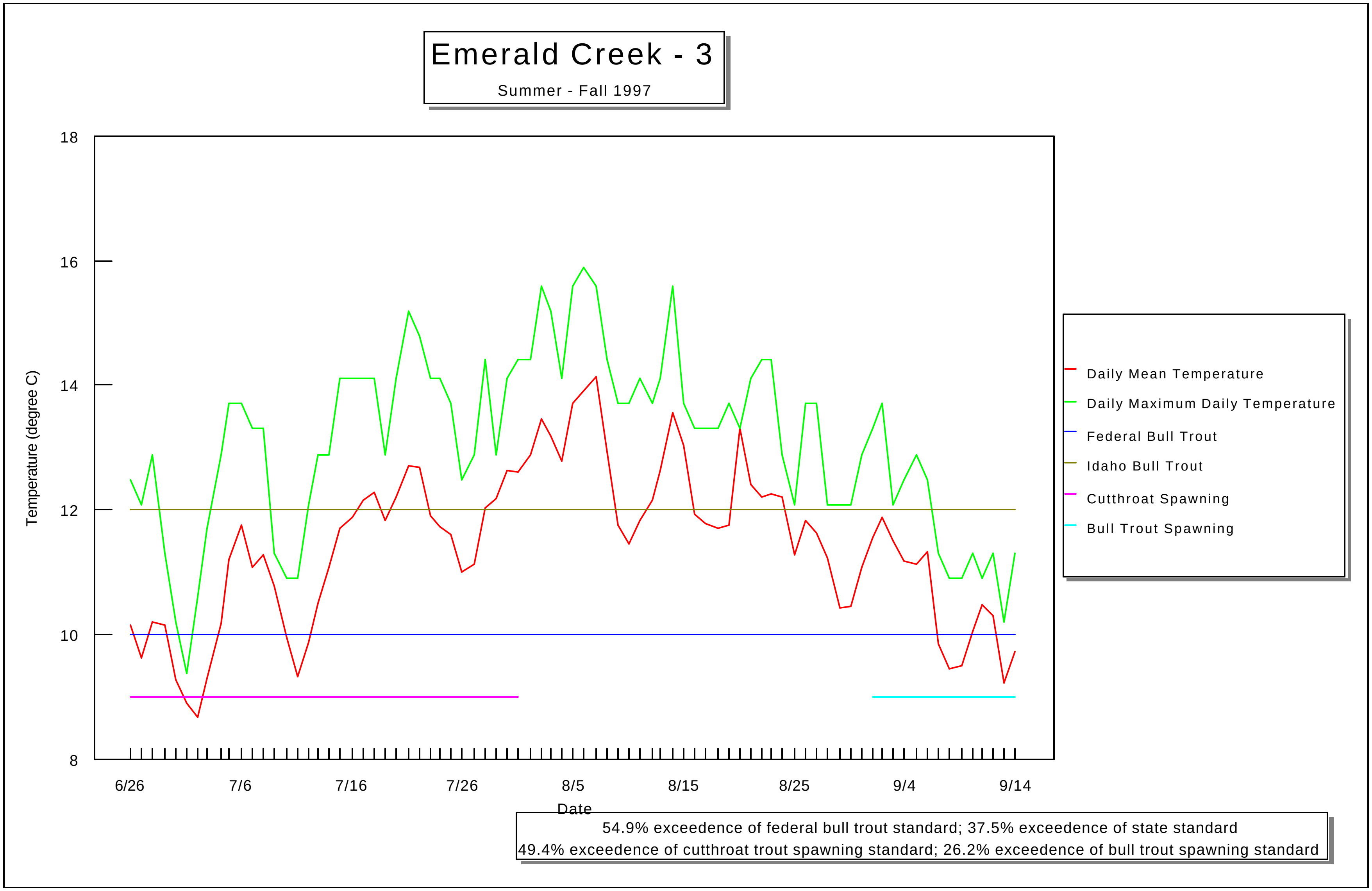

Figure B-14. Emerald Creek – 3 Water Temperature Analysis, 1997

Table B-1. USGS water quality data, Santa gaging station.

Sample Date	Sample Time	Water Temperature (Degrees C)	Air Temperature (Degrees C)	Barometric Pressure (mm of Mercury)	Inst. Discharge (cubic feet/second)	Gage Height (ft)	Specific Conductance (microsiemens/ cm)	Dissolved Oxygen (mg/l)	Dissolved Oxygen (percent saturation)
10/27/93	8:27	2	-1.5		56.1		58		
12/15/93	9:45	0	-6		98.6		53		
02/23/94	14:57	0	4.5		84.9		58		
02/24/94	14:34	0	3		91.9		58		
04/20/94	7:55	8	8.5		605		34		
07/19/94	14:10	25.5	28	698	45.6		59	8.8	118
10/23/95	13:55	6	7.5		83.4		58		
11/30/95	8:33	5.5	7.5		2840		32		
01/30/96	9:30	0	-15		197		18		
02/10/96	15:30	2	-1		4060		26		
03/14/96	14:10	5.5	16.5		868		38		
05/17/96	10:02	7.5	10.5		957		38		
06/19/96	5:58	9	10.5		209		43		
08/15/96	14:20	23	30.5		59.3		53		
10/21/98	10:00	4.5	5.5		54.6		54		
11/19/98	8:40	3	5		101		52		
12/09/98	9:50	0	0		172		46		
01/26/99	10:10	0	-3		269		44		
02/09/99	8:55	0.5	-1		428		40		
03/10/99	11:50	2	6		368		37		
04/14/99	13:15	5.6	10.5		666		34		
05/10/99	14:40		5.5		643		34		
06/07/99	17:00	9.5	12.5		504		30		
07/14/99	12:30	19.5	18.5		154	4.43	39		
08/10/99	12:15	20	30		86.1	4.13	50		
09/09/99	13:15	20	23.5		56.3	3.96	48		

Table B-1, continued.

Sample Date	Nitrogen, Nitrite Dissolved (mg/L as N)	Nitrogen, Ammonia + Organic Total (mg/L as N)	Nitrogen, Nitrate + Nitrite Dissolved (mg/L as N)	Phosphorus Total (mg/L as P)	Phosphorus, Ortho Dissolved (mg/L as P)	Calcium Dissolved (mg/L as Ca)	Magnesium Dissolved (mg/L as Mg)	Sodium Dissolved (mg/L as Na)	Chloride Dissolved (mg/L as Cl)
10/27/93									
12/15/93									
02/23/94									
02/24/94									
04/20/94									
07/19/94	0.010	0.500	0.050	0.020	0.010				
10/23/95									
11/30/95									
01/30/96									
02/10/96									
03/14/96									
05/17/96									
06/19/96									
08/15/96									
10/21/98		0.100	0.005	0.014	0.006	6.103	1.357		
11/19/98		0.100	0.005	0.021	0.005	5.799	1.346		
12/09/98		0.100	0.026	0.024	0.007	4.313	1.153		
01/26/99		0.136	0.017	0.031	0.011	3.678	1.048		
02/09/99		0.205	0.013	0.039	0.017	3.623	1.029		
03/10/99		0.102	0.005	0.023	0.006	3.433	0.927		
04/14/99						3.280	0.843		
05/10/99			0.005	0.012	0.005	3.282	0.754	1.700	0.409
06/07/99		0.161	0.006	0.013	0.003	3.261	0.686	1.470	0.315
07/14/99		0.158	0.005	0.020	0.003	4.511	0.923	1.789	0.370
08/10/99		0.120	0.005	0.016	0.008	5.634	1.225	2.134	0.640
09/09/99						6.028	1.284	2.209	0.350

Table B-1, continued.

Sample Date	Sulfate Dissolved (mg/L as SO_4)	Fluoride Dissolved (mg/L as F)	Silica Dissolved (mg/L as SiO_2)	Cadmium Dissolved (? g/L as Cd)	Cadmium Water Unfiltered Total (? g/L as Cd)	Iron Total Recoverable (? g/L as Fe)	Iron Dissolved (? g/L as Fe)	Lead Dissolved (? g/L as Pb)	Lead Total Recoverable (? g/L as Pb)
10/27/93									
12/15/93									
02/23/94									
02/24/94									
04/20/94									
07/19/94									
10/23/95									
11/30/95									
01/30/96									
02/10/96									
03/14/96									
05/17/96									
06/19/96									
08/15/96									
10/21/98				1	1			1	1
11/19/98				1	1			1	1
12/09/98				1	1			1	1
01/26/99				1	1			1	1
02/09/99				1	1			1	1
03/10/99				1	1			1	1
04/14/99				1	1			1	1
05/10/99	1.04	0.1	16.88	1	0.1	210.54	42.11	1	0.105
06/07/99	1.08	0.1	13.65	1	0.1	215.91	54.33	1	0.2
07/14/99	0.53	0.1	15.66	1	0.1	224.22	97.50	1	0.175
08/10/99	0.53	0.1	17.05	1	0.1	258.87	147.14	1	0.1
09/09/99	0.86	0.1	17.44	1	0.1	229.26	152.08	1	0.1

Table B-1, continued.

Sample Date	Manganese Total Recoverable (? g/L as Mn)	Manganese Dissolved (? g/L as Mn)	Zinc Dissolved (? g/L as Zn)	Zinc Total Recoverable (? g/L as Zn)	Coliform Fecal 0.7 UM-MF (COL/100mL)	Fecal Strep Water (COL/100mL)	Specific Conductance Lab (? s/cm)	pH (Standard Units)
10/27/93								
12/15/93								
02/23/94								
02/24/94								
04/20/94								
07/19/94					22	56		8.55
10/23/95								
11/30/95								
01/30/96								
02/10/96								
03/14/96								
05/17/96								
06/19/96								
08/15/96								
10/21/98			20	10.0				7.83
11/19/98			20	10.0				7.22
12/09/98			20	10.0				7.46
01/26/99			20	10.0				7.68
02/09/99			20	10.0				7.00
03/10/99			20	40.0				7.10
04/14/99			20	40.0				7.32
05/10/99	10.314	6.191	1.0	1.182			34.8	7.46
06/07/99	10.550	5.105	1.0	56.95			31.9	7.21
07/14/99	15.653	6.580	1.0	1.074			42.1	7.44
08/10/99	14.516	7.259	1.0	1.00			51.7	7.81
09/09/99	9.5970	5.483	1.0	1.00			53.4	7.67

Table B-2a. Coeur d’Alene Tribe data on Alder Creek, 1997.

Alder Creek	6/30/97	7/28/97	9/4/97	10/1/97	11/12/97
Sulfate (mg/L)	1.32	1.73	1.35	2.79	1.61
Chloride (mg/L)	0.77	0.73	0.84	0.81	0.80
Nitrate (mg/L)	0.34	<0.10	<0.10	<0.10	0.02
Phosphate(mg/L)	<0.10	<0.10	<0.10	<0.10	<0.03
Nitrite (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.029
Fluoride (mg/L)	0.05	0.04	0.01	<0.01	<0.02
Total Suspended Solids (mg/L)	110	10	2	2	0.5
Turbidity (NTU[1])	45.2	2.12	2.31	1.58	3.96

[1]Nephelometric Turbidity Unit

Table B-2b. Coeur d’Alene Tribe data on Alder Creek, 1998.

Alder Creek	4/29/98	5/29/98	6/25/98	7/8/98	8/13/98	9/01/98	10/19/98	11/13/98
Total Suspended Solids (mg/L)	<2	4	3	2	3	3	<2	9
Turbidity (NTU[1])	2.5	6.6	2.4	1.8	2.2	2.6	2.6	14.2
Chloride (mg/L)	0.43	0.46	0.49	0.47	0.67	0.44	0.79	1.08
Fluoride (mg/L)	0.04	0.02	0.05	0.04	0.26	0.03	<0.02	<0.02
Nitrate as N (mg/L)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.134
Nitrite as N (mg/L)	<0.029	<0.029	<0.029	<0.010	<0.010	<0.010	<0.010	<0.010
Total Phosphorous (mg/L)	<0.005	0.014	0.008	0.007	0.008	0.011	<0.005	0.010
Ortho-Phosphate as P (mg/L)	<0.026	<0.026	<0.026	<0.020	<0.020	<0.020	<0.020	<0.020
Sulfate (mg/L)	1.495	1.328	1.446	0.908	1.241	1.085	1.539	1.744
TKN[2] (mg/L)	-	-	-	<0.12	<0.12	-	0.21	-

[1]Nephelometric Turbidity Unit
[2] Total Kjeldahl Nitrogen

Table B-2c. Coeur d'Alene Tribe data on Alder Creek, 1999.

Alder Creek									
			SAMPLE DATE	03/10/99	03/26/99	4/12/99	5/14/99	6/3/99	7/13/99
ANALYSIS PARAMETERS		**METHOD**	**UNITS**						
PHYSICAL PROPERTIES									
Total Dissolved Solids		EPA 160.1	mg/L						
Total Suspended Solids		EPA 160.2	mg/L	4.67	28.5	2.20	<2.00	<2.0	<2.0
Turbidity		EPA 180.1	NTU	4.68	18.2	4.22	2.73	3.41	2.20
Hardness as $CaCO_3$[1]		EPA 200.7	mg/L						
INORGANIC, NON-METALLICS									
Chloride		EPA 300.0	mg/L	0.660	1.23	0.530	0.366	0.434	3.53
Fluoride		EPA 300.0	mg/L	<0.020	0.040	<0.020	<0.020	0.044	0.022
Nitrate as N		EPA 300.0	mg/L	0.020	0.050	0.010	<0.005	<0.005	0.009
Nitrite as N		EPA 300.0	mg/L	<0.010	<0.010	<0.010	<0.005	<0.005	<0.010
Total Phosphorous		EPA 200.7	mg/L	<0.005	0.007	<0.005	0.026	<0.005	0.017
Ortho-Phosphate as P		EPA 300.0	mg/L	<0.020	<0.020	<0.020	<0.010	<0.010	<0.020
Sulfate		EPA 300.0	mg/L	1.52	1.56	1.34	1.50	1.33	1.31
TKN[2]		EPA 351.4	mg/L	0.100	<0.100	0.223	<0.100	<0.100	0.152

[1]calcium carbonate
[2]Total Kjeldahl Nitrogen

Table B-2d. Coeur d'Alene Tribe data on Alder Creek, 2000.

Alder Creek							
		SAMPLE DATE	04/07/00	04/19/00	05/18/00	6/7/00	9/26/00
ANALYSIS PARAMETERS	**METHOD**	**UNITS**					
PHYSICAL PROPERTIES							
Total Dissolved Solids	EPA 160.1	mg/L					
Total Suspended Solids	EPA 160.2	mg/L	5.0	9.0	<2.0	3.0	5.00
Turbidity	EPA 180.1	NTU	3.35	5.57	3.60	2.03	2.30
Hardness as $CaCO_3$[1]	EPA 200.7	mg/L					
INORGANIC, NON-METALLICS							
Chloride	EPA 300.0	mg/L	0.433	0.325	0.319	0.428	0.707
Fluoride	EPA 300.0	mg/L	<0.020	<0.020	0.032	<0.020	<0.020
Nitrate as N	EPA 300.0	mg/L	0.008	0.007	<0.005	<0.005	<0.005
Nitrite as N	EPA 300.0	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010
Total Phosphorous	EPA 200.7	mg/L	<0.005	<0.005	0.035	0.038	0.023
Ortho-Phosphate as P	EPA 300.0	mg/L	<0.006	<0.006	<0.006	<0.006	<0.006
Sulfate	EPA 300.0	mg/L	1.35	1.22	1.26	1.33	1.63
TKN[2]	EPA 351.4	mg/L	0.122	0.133	0.082	0.057	0.111

[1]calcium carbonate
[2]Total Kjeldahl Nitrogen

Table B-2e. Coeur d'Alene Tribe data on Alder Creek, 2001.

Sample Date			1/9/01	2/7/01	3/7/01	4/2/01	4/18/01	5/9/01	5/21/01
Detection Limit	Method	Units							
2	EPA 160.2	mg/L	2.30	<2.0	5.60	4.40	5.00	11.0	2.00
0.02	EPA 180.1	NTU	2.75	7.20	7.86	7.13	6.63	4.95	2.93
0.02	EPA 300.0	mg/L	0.481	0.636	0.480	0.397	0.432	0.413	0.426
0.02	EPA 300.0	mg/L	<0.020	<0.020	<0.020	0.063	<0.020	0.222	<0.020
0.005	EPA 300.0	mg/L	0.075	.0156	0.075	0.028	0.010	<0.005	<0.005
0.01	EPA 300.0	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
0.005	EPA 200.7	mg/L	0.009	0.024	0.032	0.020	0.020	0.015	0.026
0.01	EPA 300.0	mg/L	<0.010	0.019	<0.010	<0.010	<0.010	<0.010	<0.010
0.03	EPA 300.0	mg/L	2.00	2.15	1.63	1.28	1.32	1.60	1.43
0.02	EPA 351.2	mg/L	0.217	0.463	0.107	<0.030	0.030	0.859	0.704

Appendix C

Sediment Model Assumptions and Documentation

Appendix C. Sediment Model and Assumptions and Documentation

Background:

Sediment is the pollutant of concern on the majority of the water quality limited streams of the Panhandle Region. The lithology or terrain of the region most often governs the form the sediment takes. Two major types of terrain dominate in northern Idaho. These are the meta-sedimentary Belt Supergroup and granitics present either in the Kaniksu batholith or in smaller intrusions such as the Round Top Pluton and the Gem Stocks. In some locations Columbia River Basalt formations are important, but these tend to be to the south and west, primarily on the Coeur d'Alene Reservation. Granitics mainly weather to sandy materials, but also weather to pebbles or larger sized particles. Pebbles and larger particles with significant amounts of sand remain in the higher gradient stream bedload. The Belt terrain produces silt size particles, pebbles, and larger particles. Silt particles are transported to low gradient reaches, while the larger particles comprise the majority of the higher gradient stream bedload. Basalts erode to silt and particles similar in size to those in the Belt terrain. Large basalt particles are less resistant and weather to smaller particles.

Any attempt to model the sediment output of watersheds will provide relative, rather than exact, sediment yields. The model documented here attempts to account for all significant sources of sediment separately. This approach is used to identify the primary sources of sediment in a watershed. This identification of primary sources will be useful as implementation plans designed to remedy these sources are developed. If additional investigation indicates sources quantified as minor are not, the model input can be altered to incorporate this new information.

Model Assumptions:

Assumptions used in the model are described below.

Land use and sediment delivery:

Revised Universal Soil Loss Equation (RUSLE) is the correct model for pastureland as it accounts for production and delivery of fine-grained sediment.

Sediment yield coefficients measured in-stream on geologies of northern and north central Idaho cover production and delivery of sediment from forested areas. These sediment yield coefficients reflect both fine and coarse sediment.

Sparse and heavy forests of all age classes, including seedling-sapling, should be assigned mid-range sediment yield coefficient values for the geologies, while areas not fully stocked by Forest Practices Act standards should be assigned values in the upper end of the range.

Sediment yield coefficients can be modified within the range observed to estimate road corridor land use and the effects of repeated wild fires.

Double burned areas have eroded significantly to the stream channel but are not now eroding; a residual sediment load in the channels is possible from previous catastrophic burns.

Erosion from stream bank lateral recession can be estimated with the direct volume method (Erosion and Sediment Yield 1983).

Road sediment production and delivery:

Road erosion using the Cumulative Watershed Effects (CWE) approach should be limited to the 200 feet of road on either side of road crossings, not tied to total road mileage.

The use of the McGreer relationship between the CWE score and road surface erosion is a valid estimate of road surface fines production and yield. In the case of Belt terrain, it is a conservative (overestimate) estimate.

The CWE data collected for actual road fill failures and sediment delivery reflect the situation throughout the watershed. Since the great majority of road failures occur during episodic high discharge events with a 10- to 15-year return period, road failures reflect the actions of the last large event and must be divided by ten for an annualized estimate.

Fines and coarse loading can be estimated for stream reaches where roads encroach on the stream using estimated erosion rates on defined model cross-sections. Erosion resulting from encroachment occurs primarily during episodic high discharge events with a 10- to15-year return period, so road encroachment erosion must be divided by ten for an annualized estimate.

Failing road fill and eroding bank material is composed of fines and coarse material. The proportions of fines and coarse material can be estimated from the soil series descriptions of the watershed.

Sediment delivery:

One hundred percent delivery from forestlands with sediment yield coefficients measured in-stream on geologies of northern and north central Idaho.

One hundred percent delivery from agricultural lands estimated with RUSLE.

One hundred percent delivery from all road miles up to 200 feet from a stream crossing as estimated by the McGreer relationship.

Fines and coarse materials are delivered at the same rate from fill failures and from erosion resulting from road encroachment and bank erosion.

Model Approach:

The sediment model attempts to account for all sources of sediment by partitioning these sources into broad categories.

Land use is the primary broad category. It is treated separate from other characteristics such as stream bank erosion and roads. Land use types are divided into agricultural, forest, urban, and roads.

Agriculture may be subdivided into working farms and ranches and small ranchettes, which currently exist on subdivided agriculture land. Sediment yields from agricultural lands that receive any tillage, even on an infrequent basis, are modeled with RUSLE. Sediment yields were estimated from agricultural lands (rangeland, pasture, and dry agriculture) using RUSLE (equation 1)(Hogan 1998).

Equation 1: $A = (R)(K)(LS)(C)(D)$ tons per acre per year where:

: A is the average annual soil loss from sheet and rill erosion
: R is climate erosivity
: K is the soil erodibility
: LS is the slope length and steepness
: C is the cover management
: D is the support practices

The RUSLE does not take into account stream bank erosion, gully erosion, or scour. It applies to cropland, pasture, hay land, or other land that has some vegetative development by tilling or seeding. Based on the soils, characteristics of the agriculture, and the slope, sediment yields were developed for the agricultural lands of each watershed. The RUSLE develops values that reflect the amount of sediment eroded and delivered to the active channel of the stream system annually.

Forestlands and some land in road rights of way are modeled using the mean sediment export coefficients measured in-stream on geologies of northern and north central Idaho (USFS 1994). The values developed by these sediment yield coefficients are the amount of sediment eroded and the amount of sediment delivered to the stream courses annually. Forestlands that are fully stocked with trees are treated with the median coefficient for sediment yields ascribed to that terrain. Lands not fully stocked by Idaho Forest Practices Act standards are assigned the highest coefficient of the range. Paved road rights of ways are assigned the lowest coefficient of the range. Areas that were burned by two large wild fires as delineated in the IPFIRES model are adjusted by a coefficient that is the difference between the highest value of the coefficient for the geologic type and the median.

All coefficients are expressed as tons per acre per year and are applied to the acreage of each land type developed from Geographical Information System (GIS) coverages. All land uses are displayed with estimated sediment delivery. Land use sediment delivery is totaled.

Roads are treated separately by the model. Forest haul roads are differentiated from county and private residential roads. County roads often have larger stream passage structures and are normally much wider and have gravel or pavement surfacing. Private residential roads are often limited in length, but can have poor stream crossing structures. Sediment yields from county and private roads are modeled using a newer RUSLE model (Sandlund 1999). Road relief, slope length, surfacing, soil material, and width are the most critical factors. The sediment yield was applied only to the 200 feet on either side of stream crossings. Failure of county and private road fills was assumed nonexistent, because such roads are often on gentle terrain. As a consequence, road fill failures are rare.

Forest roads were modeled using data developed with the cumulative watershed effects (CWE) protocol. A watershed CWE score was used to estimate surface erosion from the road surface. Forest road sediment yield was estimated using the relationship between the CWE score and the sediment yield per mile of road (Figure B-1). The relationship was developed for roads on a Kaniksu granitic terrain in the LaClerc Creek watershed (McGreer 1998). Its application to roads on Belt terrain conservatively estimates sediment yields from these systems. The watershed CWE score was used to develop a sediment tons per mile value, which was multiplied by the estimated road mileage affecting the streams. It was assumed that all sediment was delivered to the stream system. This is a conservative estimate of actual delivery.

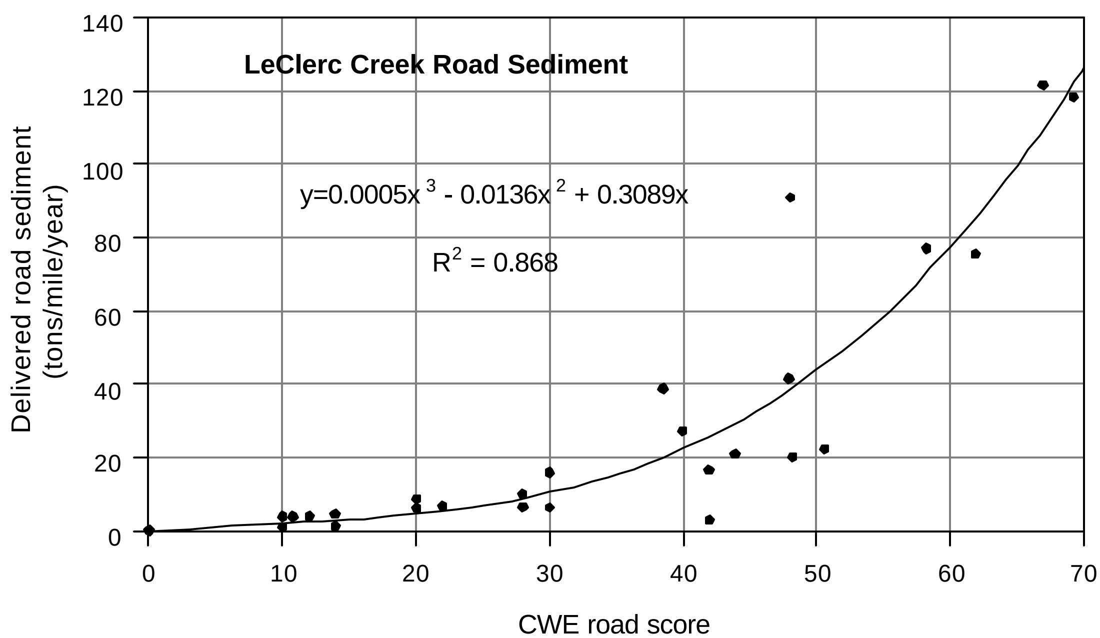

Figure C-1. Sediment Export of Roads Based on Cumulative Watershed Effects Scores

Forest road failure was estimated from actual CWE road fill failure and delivery data. These failures were interpreted as primarily the result of large discharge events that occur on a 10- to 15-year return period (McClelland *et. al* 1997). The estimates were annualized by dividing the measured values by 10. The data are typically from a subset of the roads in a watershed. The sediment delivery value was scaled using a factor reflecting the watershed road mileage divided by the road mileage assessed. The sediments delivered through this mechanism contain both fine (material including, and smaller than, pebbles) and coarse material (larger sizes). The percentages of fine and coarse particles were estimated using the described characteristics of the soil series found in the watershed. The weighted average of the fines and coarse composition of the B and C soil horizons to a depth of 36 inches was developed using the soils GIS coverage STATSGO, which contains the soils composition data provided by soils survey documents. The B and C horizons' composition was used because these are the strata from which forest roads are normally constructed. Based on the developed soil composition percentage and the estimated probable yield, the tons of fine and coarse material delivered to the streams by fill failure were calculated. This approach assumes equal delivery of fine and coarse materials.

Roads cause stream sedimentation by an additional mechanism. The presence of roads in the floodplain of a stream most often interferes with the stream's natural tendency to seek a steady state gradient. During high discharge periods, the constrained stream often erodes at the roadbed, or, if the bed is armored, erodes at the opposite bank or its bed. The erosion resulting from a road imposed gradient change results in stream sedimentation. The model assumes the roads causing gradient effects to be those within 50 feet of the stream. The model then assumes 0.25-inch erosion per lineal foot of bed and bank up to 3 feet in height. The 0.25-inch cross-section erosion is assumed to be uniform over the bed and banks. The erosion rate was selected from a model curve of erosion in inches compared to modeled sediment yields from a channel 10 feet in width (Figure B-2). The stream cross-section used was based on the weighted bank full width for all measurements made of streams in the Beneficial Use Reconnaissance and Use Attainability programs. The erosion is from the soil types in the basin with the weighted percentages of fine and coarse material. A bulk soil density of 2.6 grams per cubic centimeter is used to convert soil volume into weight in tons. The tons of fine and coarse material are totaled for all road segments within 50 linear feet of the stream. The bulk of this erosion is assumed to occur during large discharge events, which occur on a 10- to 15-year return period (McClelland *et. al* 1997). The estimates were annualized by dividing the measured values by 10.

Estimates of bank recession are appropriate primarily along low gradient Rosgen B and C channels (Rosgen 1985). The direct volume method as discussed in the *Erosion and Sediment Yield: Channel Evaluation Workshop* (1983) was employed to make the estimates. The method relies on measurements of eroding bank length, lateral recession rate, soil type, and particle size to make these estimates. A field crew collected these data. The fine and coarse material fractions of the bank material based on STATSGO GIS coverage are used to estimate fine and coarse material delivery to the stream. These values are added into the watershed sediment load.

The model does not consider sediment routing, nor does it attempt to estimate the erosion to streambeds and banks resulting from localized sediment deposition in the streambed. The model does not attempt to measure the effects of additional water capture at road crossings. It is assumed, that on the balance, the additional stream power created by additional water capture over a shorter period would increase net export of sediment, even though some erosion would be caused by this watershed effect.

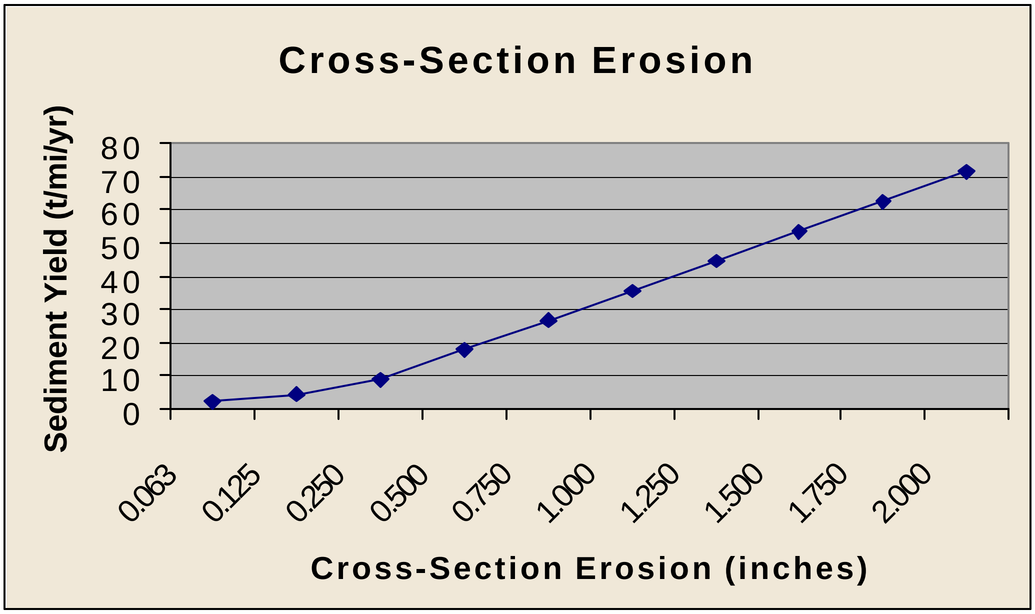

Figure C-2. Modeled Sediment Yield from Thickness of Cross-Section Erosion

Model Operation:

The model is an Excel workbook composed of four spreadsheets. Key data, such as acreages and percentages, are entered into sheets one and two of the model. The total estimated sediment from the varied sources is calculated in spreadsheet three. County and private road data are supplied in sheet four.

Assessment of Model's Conservative Estimate:

Several conservative assumptions were made in the model construction, which cause it to develop conservatively high estimations of sedimentation of the streams modeled. These assumptions are listed in the following paragraphs and a numerical assessment of the magnitude of the conservatism is assigned.

The model uses RUSLE and forest sediment yield coefficients to develop land use sediment delivery estimates. The output values are treated as delivery to the stream. The RUSLE assumes delivery if the slope assessed is immediately up gradient from the stream system. This is not the case on the majority of the agricultural land assessed. Estimates made in the Lake Creek Sediment Study indicate that at most 25% of the erosion modeled was delivered as sediment to the stream (Bauer, Golden, and Pettit 1998). A similar local estimate has not been made with sediment yield coefficients, but it is likely that this estimate would be 25% as well. The land use model component is 75% conservative.

The roads crossing component of the model assumes 100% delivery of fine sediment from the 200 feet on either side of a stream crossing. It is more likely that some fine sediment remains in ditches. A reasonable level of delivery is 80%. The model is likely 20% conservative in this component. On Belt terrain, use of the McGreer model is conservative. Since the sediment yield coefficients measured in-stream for Kaniksu granites is 167% of the coefficient for Belt terrain, this factor is estimated to be 67% conservative.

Road encroachment is defined as the existence of a road within 50 feet of either side of the stream, primarily because this is near the resolution of commonly used GIS mapping techniques. A road 50 feet from a stream, but on a side hill, would not affect the stream gradient. The model is likely incorrect on encroachment 20% of the time and is conservative by this factor.

Fill failure data is developed from actual CWE field assessments. The CWE assessment does not assess all the roads in the watershed. The failure rate data is scaled up by the factor of the roads assessed divided into the actual watershed road mileage. The roads assessed are typically those remote from the stream system, which are very unlikely to deliver sediment to the stream. The percentage of watershed roads assessed varies, but it is commonly 60% or less of the watershed roads. The model is 40% conservative in this component.

Table B-1 summarizes the conservative assumptions and assesses its numerical level of over-estimation.

Table C-1. Conservative estimate of stream sedimentation provided by the sediment model.

Model Factor	Kaniksu Granites (% Conservative)	Belt Supergroup (% Conservative)
100% RUSLE[1] and forest land sediment yield delivery	75%	75%
Crossing delivery	29%	20%
McGreer model	0%	67%
Road encroachment at 50 feet	20%	20%
Road failure	40%	40%
Total overestimate	164%	231%

[1] Revised Universal Soil Loss Equation

The model provides an overestimate by factors of 1.6 and 2.3 for the Kaniksu and Belt terrain, respectively. This overestimation is a built-in margin of safety.

Model Verification:

Some verification of the model can be developed by comparing measured sediment loads with those predicted by the model. For example, the U.S. Geological Survey measured sediment load at the Enaville Station on the Coeur d'Alene River during water year 1999. Based on these measured estimates, the sediment load per square mile of the basin above this point was calculated to be 28 tons (URS Greiner 2001). The middle value of the Belt geology sediment yield coefficient range is 14.7 tons per square mile. The model outputs for several watersheds of the North Fork Coeur d'Alene River are provided in Table B-2. The model predicted a sediment yield of 33.6 tons/square mile for the entire subbasin. The agreement between the measured estimates and the modeled estimates is good.

Table C-2. Modeled sediment output from selected North Fork Coeur d'Alene River watersheds, reflecting agreement between measured estimates and modeled estimates.

Watershed	Square miles	Modeled sediment (tons)	Tons/square mile
Deer	10.0	153.1	15.3
Alden	7.9	158.5	20.1
Independence	59.5	1,156.1	19.4
Trail	25.2	976.1	38.7
Flat	17.6	711.9	40.5
Prichard	53.6	1,636.5	30.6
Burnt Cabin	28.8	1,325.7	46.0
Skookum	7.1	191.2	26.9
Bumblebee	24.9	901.2	36.2
Streamboat	41.4	1,955.3	47.2
Graham	9.3	138.4	14.9
Little North Fork	169.0	6,769.2	40.1
North Fork Total[1]	903.2	30,369.7	33.6

[1]Total includes watersheds not listed above.

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Appendix D

Sediment Model Spreadsheets

Appendix D. Sediment Model Spreadsheets

Table D-1. St. Maries west side watersheds land use.

St. Maries West Side Watersheds Land Use

Watershed	Alder[1]	John	Santa	Santa Sidewalls	Charlie	Tyson	Carpenter	Emerald	West Fork Sidewalls	West Fork	Cats Spur	Carlin	Sheep	Childs	Cedar
Agricultural Land (ac)	1,080	0	2,379	825	952	303	1,129	1,125	0	774	0	0	0	0	0
Forest Land (ac)	9,408	12,666	13,648	7,584	15,423	5,327	9,966	15,925	3,683.9	8,511	7,283	1,801	1,455	3,046	2,115
Unstocked forest (ac)	4506	1,922	499	2,906	702	1,329	1,196	2,102	736	1,083	0	0	0	0	0
Double Fires (ac)	0	0	0	0	2,046	172	0	350	0	0	0	0	0	0	0
Highway (ac)	0	0	108	0	0	0	0	0	25	29	0	0	0	0	0
	14,994	14,588	16,634	11,315	19,123	7,131	12,291	19,502	4,445	10,397	7,283	1,801	1,455	3,046	2,115
Road Data															
Forest Roads (mi)	157.7	148.5	138.2	126.3	84.3	75.1	126.9	216	46.5	101.6	84	19	25.7	44.4	11.6
Ave. Road Density (mi/sq mi)	6.73123	6.51473	5.31730	7.1438	2.8213	6.7401	6.6078	7.0885	6.6953	6.2541	7.3816	6.7518	11.304	9.3289	3.5102
Road Crossing Number	176	217	532	360	273	192	290	392	60	429	103	14	8	68	12
Road Crossing Freq.	1.11604	1.46128	3.84949	2.8503	3.2384	2.5566	2.2853	1.8148	1.2903	4.2224	1.2262	0.7368	0.3113	1.5315	1.0345
Mass Failure (tons/yr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Encroaching Forest Roads (mi)	9.37	11.34	16.441	12.19	8.08	5.4	10.651	15.22	2.096	13.113	4.352	0.929	0.239	2.315	0.754
Mean Bank full Width + two 3 foot banks	21.4	9	16	12.7	12.7	9	9.3	13.3	9.3	13.3	13.3	21.4	12	19.9	18.3
CWE Score	12 [2]	14	13	13	10	15	15	12	24	24	24	15	13	12	10
Tons/Mile CWE	2.6	3.031	2.8158	2.8	2.2	3.3	3.3	2.6124	6.5	6.5	6.5	3.261	2.8158	2.6124	2.229
Miles CWE[3]	0	33.8	21.9	25.3	32.1	17.4	9.9	25.8	1	13.4	1	0.1	0.1	0.1	0.1

[1]Acreage supplied by the Coeur d'Alene Tribal staff.
[2]CWE values extrapolated from John Creek.
[3]The Carlin Creek CWE Score and Bank full Width + two, 3 foot Banks values assumed according to Alder Creek and Alder-Joe Watersheds. Flat and Soldier Creeks CWE Score and Bank full Width + two, 3 foot Banks values assumed according to Thorn Creek and Beaver-Alder Watersheds. Sheep Creek CWE Score and Bank full Width + two, 3 foot Banks values assumed according to Tyson Creek and Tyson-Beaver values. The Childs Creek CWE Score and Bank full Width + two, 3 foot Banks values assumed according to Clarkia-Childs and Childs-Tyson Watersheds. Blair and Cedar Creeks CWE Score and Bank full Width + two, 3 foot Banks values assumed according to Clarkia-Childs Watershed.

Table D-2. St. Maries River west side segments sediment yield.[1]

St. Maries River West Side Segments Sediment Yield

Watershed	Alder	John	Santa	Santa Sidewalls	Charlie	Tyson	Carpenter	Emerald	West Fork Sidewalls	West Fork	Cats Spur	Carlin	Sheep	Childs	Cedar
Agriculture (tons/yr)(fine)	32.4	0.0	130.8	45.4	57.1	27.3	101.6	22.5	0.0	41.8	0.0	0.0	0.0	0.0	0.0
Conifer Forest (tons/yr)(fine)	159.0	214.1	255.5	125.1	291.9	74.9	210.7	348.1	109.6	143.3	115.8	30.4	20.4	65.2	45.2
(coarse)	57.3	77.2	58.4	49.4	62.8	47.7	18.6	161.5	8.3	129.1	117.2	11.0	13.0	4.9	3.4
Unstocked Forest (tons/yr)(fine)	89.4	38.1	11.0	56.3	15.6	21.9	29.7	57.4	27.4	22.8	0.0	0.0	0.0	0.0	0.0
(coarse)	32.2	13.8	2.5	22.2	3.4	14.0	2.6	26.7	2.1	20.5	0.0	0.0	0.0	0.0	0.0
Double Fires (tons/yr)(fine)	0.0	0.0	0.0	0.0	6.7	0.4	0.0	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(coarse)	0.0	0.0	0.0	0.0	1.4	0.3	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Highway (tons/yr)(fine)	0.0	0.0	1.6	0.0	0.0	0.0	0.0	0.0	0.6	0.4	0.0	0.0	0.0	0.0	0.0
(coarse)	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0
Total Yield (tons/yr)(fine)	280.9	252.3	398.9	226.7	371.4	124.5	341.9	429.4	137.6	208.2	115.8	30.4	20.4	65.2	45.2
(coarse)	89.6	91.0	61.3	71.6	67.6	61.9	21.2	188.9	10.4	150.0	117.2	11.0	13.0	4.9	3.4

County, Forest, and Private Road Sediment Yield

Watershed	Alder	John	Santa	Santa Sidewalls	Charlie	Tyson	Carpenter	Emerald	West Fork Sidewalls	West Fork	Cats Spur	Carlin	Sheep	Childs	Cedar
Forest Road															
Surface fine sediment (tons/yr)	34.7	49.8	113.5	76.4	45.5	48.0	72.5	77.6	29.5	211.3	50.7	3.5	1.7	13.5	2.0
Road failure fines (tons/yr)[2]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Road failure coarse (tons/yr)[2]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Encroachment fines (tons/yr)[3]	131.5	66.9	191.0	99.0	75.3	26.5	81.2	123.3	16.2	81.8	25.7	13.0	1.6	38.2	11.4
Encroachment coarse (tons/yr)[3]	47.4	24.1	43.6	39.1	16.2	16.9	7.2	57.2	1.2	73.7	26.0	4.7	1.0	2.9	0.9
Total Fine Yield (tons/yr)	166.1	116.7	304.5	175.4	120.8	74.5	153.7	200.9	45.7	293.1	76.4	16.5	3.3	51.7	13.5
Total Coarse Yield (tons/yr)	47.4	24.1	43.6	39.1	16.2	16.9	7.2	57.2	1.2	73.7	26.0	4.7	1.0	2.9	0.9
Total Sediment (tons/yr)	584.0	484.1	808.3	512.7	576.0	277.7	524.0	876.4	194.9	725.0	335.4	62.6	37.7	124.6	63.0
Percent Fines[4]	0.735	0.735	0.814	0.717	0.823	0.611	0.919	0.683	0.93	0.526	0.497	0.735	0.611	0.93	0.93
Percent Coarse	0.265	0.265	0.186	0.283	0.177	0.389	0.081	0.317	0.07	0.474	0.503	0.265	0.389	0.07	0.07

Table D-2, continued.

Belt Yield Coeff.	Meto-Belt (tons/ac/year)		Ag coeff.	t/ac/yr
			John	0.03
0.023	0.032	forest	Santa+Sidewalls	0.055
			Charlie	0.06
0.027	0.04	unstocked	Tyson	0.09
			Carpenter	0.09
0.004	0.006	double fire	Emerald	0.02
			West Fork+Sidewalls	0.054
0.018	0.026	highway	Catspur	0.02

[1]John Creek CWE scores and STATSCO soils and ag coefficients applied to Alder Creek. Percent fines and percent coarse values for Carlin Creek are estimated based on Alder and John Creeks Watershed values. Percent fines and percent coarse values for Flat and Soldier Creeks are estimated based on Thorn Creek Watershed values. Percent fines and percent coarse values for Sheep Creek are estimated based on Tyson Creek Watershed values. Percent fines and percent coarse values for Childs, Blair, and Cedar Creeks are estimated based on Clarkia-Childs Watershed values.

[2] From weighted average of fines and stones in soils groups.

[3] Uses mass failure and delivery rates developed from CWE protocol pro-rated for road miles and annualized tons delivered x (road mileage/road mileage assessed)/10 years.

[4] Assume: 0.25” from 3-foot banks; density = 2.6 g/cc

0.020833 0.25" yr/12"

8098662 Q24*y*5280*28317cc/ft3*2.6 g/cc = g/10 year

0.891923 t/mile

Table D-3. St. Maries west side watersheds sediment export.

Subwatershed	Alder	John	Santa	Santa Sidewalls	Charlie	Tyson	Carpenter	Emerald	West Fork Sidewalls	West Fork	Cats Spur	Carlin	Sheep	Childs	Cedar
Land use fines export (tons/yr)	280.9	252.3	398.9	226.7	371.4	124.5	341.9	429.4	137.6	208.2	115.8	30.4	20.4	65.2	45.2
Land use coarse export (tons/yr)	89.6	91.0	61.3	71.6	67.6	61.9	21.2	188.9	10.4	150.0	117.2	11.0	13.0	4.9	3.4
Road fines export (tons/yr)	166.1	116.7	304.5	175.4	120.8	74.5	153.7	200.9	45.7	293.1	76.4	16.5	3.3	51.7	13.5
Road coarse export (tons/yr)	47.4	24.1	43.6	39.1	16.2	16.9	7.2	57.2	1.2	73.7	26.0	4.7	1.0	2.9	0.9
Bank erosion fines (tons/yr)	53.7	20.9	580.0	0.0	237.8	24.1	113.8	85.8	0.0	222.1	0.0	0.0	0.0	0.0	0.0
Bank erosion coarse (tons/yr)	19.4	7.5	132.5	0.0	51.2	14.1	10.0	39.2	0.0	6.3	0.0	0.0	0.0	0.0	0.0
Total fines export (tons/yr)	500.7	389.9	1283.4	402.1	730.0	223.1	609.4	716.1	183.3	723.4	192.2	46.9	23.7	116.8	58.7
Total coarse export (tons/yr)	156.4	122.6	237.4	110.6	135.0	92.8	38.3	285.3	11.6	230.0	143.2	15.7	14.0	7.8	4.3
Total (tons/yr)	657.1	512.5	1520.8	512.7	865.0	315.9	647.8	1001.4	194.9	953.4	335.4	62.6	37.7	124.6	63.0
Natural Background	344.9	335.5	380.1	260.2	392.8	160.1	282.7	612.9	141.4	331.8	233.1	41.4	33.5	70.1	48.6
Percent above background	90.5	52.7	300.1	97.0	120.2	97.4	129.1	63.4	37.8	187.4	43.9	51.2	12.7	77.9	29.5

Table D-4. St. Maries east side watersheds land use.

St Maries East Side Watersheds

Land Use

Watershed	Thorn	Beaver	Renfro	Crystal	Merry	Flewsie	Gold Center	Middle Fork Sidewalls	Middle Fork	Olson	Adams	Flat	Soldier	Blair
Agricultural Land (ac)	51	0	214	0	0	0	0	0	1,300	0	0	0	0	0
Forest Land (ac)	9,373	3,242	10,096	4,632	9,310	1,604	9,121	4,816	6,824	5,720	1,670	6,636	2,204	1,745
Unstocked Forest (ac)	1,390	1,052	276	371	2,239	187	967	1.7	2,628	0	0	0	0	0
Double Fires (ac)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Highway (ac)	33	0	0	0	0	0	0	0	0	0	0	0	0	0
	10,847	4,294	10,586	5,003	11,549	1,791	10,088	4,817.7	10,752	5,720	1,670	6,636	2,204	1,745

Table D-4, continued.

Watershed	Thorn	Beaver	Renfro	Crystal	Merry	Flewsie	Gold Center	Middle Fork Sidewalls	Middle Fork	Olson	Adams	Flat	Soldier	Blair
Forest Roads (mi)	143	44.1	97.6	47.5	184.3	30.9	63.6	52	104	47	11.9	49	31	22.9
Ave. Road Density (mi/sq mi)	8.437356	6.572892	5.90062	6.076354	10.2131	11.04188	4.034893	6.90786	6.190476	5.258741	4.560479	4.7257	9.0018	8.3988
Road Crossing Number	193	56	136	57	184	34	76	30	148	65	28	49	35	19
Road Crossing Freq.	1.34965	1.269841	1.39344	1.2	0.99837	1.100324	1.194969	0.57692	1.423077	1.382979	2.352941	1	1.1290	0.8297
Mass Failure (tons/yr)	0	0	0	0	0	0	10	0	5	0	0	0	0	0
Encroaching Forest Roads (mi)	10.364	2.23	4.96	1.52	8.96	1.22	2.685	1.9	5.9	0.891	1.56	2.46	1.86	0.646
Mean Bank full width + two 3 foot banks	10.3	10.3	11.3	9.3	16	9.3	14.2	12.7	16.5	13.5	13.5	10.3	10.3	18.3
CWE Score	18	14	13	26	12	16	16	16	13	22	22	17	17	10
Tons/Mile CWE	4.1	3	2.8	7.6	2.6	3.5	3.5	3.5	2.8	0	0	3.7774	3.7774	2.229
Miles CWE	20.6	7.1	15	17.5	26.8	11.8	8.3	0.1	36.2	0.1	0.1	0.1	0.1	0.1

Table D-5. St. Maries River east side watershed sediment yield.[1]

St. Maries River East Side Watershed Sediment Yield

Watershed	Thorn	Beaver	Renfro	Crystal	Merry	Flewsie	Gold Center	Middle Fork Sidewalls	Middle Fork	Olson	Adams	Flat	Soldier	Blair
Agriculture (tons/yr)(fine)	1.5	0.0	12.8	0.0	0.0	0.0	0.0	0.0	71.5	0.0	0.0	0.0	0.0	0.0
Conifer Forest (tons/yr)(fine)		150.3	57.9	129.3	56.5	199.1	34.3	195.1	103.0	91.2	69.7	148.0	49.2	37.3
(coarse)	65.3	16.6	102.9	50.1	15.0	2.6	14.7	7.8	65.8	61.8	18.1	64.3	21.4	2.8
Unstocked Forest (tons/yr)(fine)	26.2	22.1	4.2	5.3	56.2	4.7	24.3	0.0	41.2	0.0	0.0	0.0	0.0	0.0
(coarse)	11.4	6.3	3.3	4.7	4.2	0.4	1.8	0.0	29.7	0.0	0.0	0.0	0.0	0.0
Double Fires (tons/yr)(fine)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(coarse)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Highway (tons/yr)(fine	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(coarse)	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Yield (tons/yr)(fine)	178.4	80.0	146.3	61.8	255.4	39.0	219.4	103.1	203.9	69.7	20.4	148.0	49.2	37.3
(coarse)	76.9	23.0	106.2	54.8	19.2	2.9	16.5	7.8	95.5	61.8	18.1	64.3	21.4	2.8

Table D-5, continued.

County, Forest, and Private Road Sediment Yield

Watershed	Thorn	Beaver	Renfro	Crystal	Merry	Flewsie	Gold Center	Middle Fork Sidewalls	Middle Fork	Olson	Adams	Flat	Soldier	Blair
Forest road														
Surface fine sediment (tons/yr)	59.9	12.7	28.8	32.8	36.2	9.0	20.2	8.0	31.4	0.0	0.0	14.0	10.0	3.2
Road failure fines (tons/yr)[2]	0.0	0.0	0.0	0.0	0.0	0.0	7.1	0.0	0.8	0.0	0.0	0.0	0.0	0.0
Road failure coarse (tons/yr)[2]	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.6	0.0	0.0	0.0	0.0	0.0
Encroachment fines (tons/yr)[3]	66.4	15.9	27.8	6.7	118.9	9.4	31.6	20.0	50.4	5.7	10.0	15.8	11.9	9.8
Encroachment coarse (tons/yr)[3]	28.8	4.6	22.1	5.9	9.0	0.7	2.4	1.5	36.4	5.0	8.8	6.8	5.2	0.7
Total fine yield (tons/yr)	126.3	28.6	56.7	39.5	155.2	18.4	58.9	28.0	82.7	5.7	10.0	29.8	21.9	13.0
Total coarse yield (tons/yr)	28.8	4.6	22.1	5.9	9.0	0.7	2.9	1.5	37.0	5.0	8.8	6.8	5.2	0.7
Total sediment (t/yr)	440.5	136.2	399.0	164.5	438.7	61.1	305.3	140.3	664.3	142.3	57.2	249.0	97.6	53.9
Percent fines[4]	0.697	0.777	0.557	0.53	0.93	0.93	0.93	0.93	0.581	0.53	0.53	0.697	0.697	0.93
Percent coarse	0.303	0.223	0.443	0.47	0.07	0.07	0.07	0.07	0.419	0.47	0.47	0.303	0.303	0.07

Belt Yield Coeff.	Meto-Belt (tons/ac/year)		Ag Coeff	(t/ac/yr)
			Thorn	0.03
0.023	0.032	forest	Beaver	NA
			Renfro	0.06
0.027	0.04	unstocked	Crystal	NA
			Merry	0.02
0.004	0.006	double fire	Flewsie	NA
			Gold Center	0.02
0.018	0.026	highway	Middle Fork + Sidewalls	0.055

[1]Percent fines and percent coarse values for Olson and Adams Creeks are estimates based on the adjacent Crystal Creek Watershed Values.

[2]Uses mass failure and delivery rates developed from CWE protocol pro-rated for road miles and annualized tons deli

[3]Assume: one -quarter inch from three feet banks; density = 2.6 g/cc.

0.020833 0.25"yr/12"
Q24*y*5280*28317cc/ft3*2.6
8098662 g/cc = g/10 yr
9080000 454g/lb* 2000 lb/t*10 year
0.891923 t/mile

[4]From weighted average of fines and stones in soils groups.

Table D-6. St. Maries River east side watersheds sediment export.

St. Maries River East Side Watersheds Sediment Export

Watershed	Thorn	Beaver	Renfro	Crystal	Merry	Flewsie	Gold Center	Middle Fork Sidewalls	Middle Fork	Olson	Adams	Flat	Soldier	Blair
Land use fines export (tons/yr)	178.4	80.0	146.3	61.8	255.4	39.0	219.4	103.1	203.9	69.7	20.4	148.0	49.2	37.3
Land use coarse export (tons/yr)	76.9	23.0	106.2	54.8	19.2	2.9	16.5	7.8	95.5	61.8	18.1	64.3	21.4	2.8
Road fines export (tons/yr)	126.3	28.6	56.7	39.5	155.2	18.4	58.9	28.0	82.7	5.7	10.0	29.8	21.9	13.0
Road coarse export (tons/yr)	28.8	4.6	22.1	5.9	9.0	0.7	2.9	1.5	37.0	5.0	8.8	6.8	5.2	0.7
Bank erosion fines (tons/yr)	21.0	0.0	37.7	1.3	0.0	0.0	7.1	0.0	142.5	0.0	0.0	0.0	0.0	0.0
Bank erosion course (tons/yr)	9.1	0.0	30.0	1.2	0.0	0.0	0.5	0.0	102.7	0.0	0.0	0.0	0.0	0.0
Total fines export (tons/yr)	325.7	108.7	240.7	102.6	410.5	57.4	285.4	131.0	429.1	75.4	30.3	177.8	71.1	50.3
Total coarse export (tons/yr)	114.8	27.5	158.3	61.9	28.2	3.6	19.9	9.3	235.2	66.9	26.9	71.2	26.5	3.5
Total (tons/yr)	440.5	136.2	399.0	164.5	438.7	61.1	305.3	140.3	664.3	142.3	57.2	249.0	97.6	53.9
Natural Background	248.7	98.8	243.5	115.1	265.6	41.2	232.0	110.8	247.3	131.6	38.4	212.4	70.5	40.1
Percent Above Background	77.1	37.9	63.9	42.9	65.2	48.3	31.6	26.6	168.6	8.2	48.9	17.2	38.4	34.3

Table D-7. St. Maries immediate watersheds land use.

St Maries Immediate Watersheds Land Use

Subwatershed	Clarkia-Childs	Childs-Tyson	Tyson-Beaver	Beaver-Alder	Alder-Mouth
Agricultural Land (ac)	87	845	0	0	515
Forest Land (ac)	4,472	9,565	2,363	6,345	10,159
Unstocked Forest (ac)	287.7	728	339	1,783	1,297
Double Fires (ac)	0	0	0	0	0
Highway (ac)	37	54	20	45	13
	4,883.7	11,192	2,722	8,173	11,984
Road Data					
Forest roads (mi)	64.7	106.1	34.6	66.6	121.6
Ave. road density (mi/sq mi)	8.4788173	6.067191	8.135195	5.215221	6.493992
Road crossing number	90	192	34	83	115

Table D-7, continued.

Watershed	Clarkia-Childs	Childs-Tyson	Tyson-Beaver	Beaver-Alder	Alder-Mouth
Road crossing freq.	1.39103555	1.809614	0.982659	1.246246	0.945724
Mass Failure (tons/yr)	0	0	0	0	20
Encroaching Forest Roads (mi)	3.747	7.244	2.1	4.178	4.9
Mean Bank full width + two 3 foot banks	18.3	21.4	21.4	21.4	21.4
CWE score	10	14	12	16	17
Tons/Mile CWE	2.2	3.0	2.6	3.5	3.8
Miles CWE	7	11.8	6.2	2.3	8.1

Table D-8. St. Maries River immediate watershed sediment yield.

St. Maries River Immediate Watershed Sediment Yield

Watershed	Clarkia-Childs	Childs-Tyson	Tyson-Beaver	Beaver-Alder	Alder-Mouth
Agriculture (tons/yr)(fines)	5.2	50.7	0.0	0.0	30.9
Conifer Forest (tons/yr)(fine)	95.7	174.7	49.6	123.0	189.5
(coarse)	7.2	45.3	4.7	22.9	44.2
Unstocked Forest (tons/yr)(fine)	7.2	15.6	8.4	40.6	28.4
(coarse)	0.5	4.0	0.8	7.6	6.6
Double Fires (tons/yr)(fine)	0.0	0.0	0.0	0.0	0.0
(coarse)	0.0	0.0	0.0	0.0	0.0
Highway (tons/year) (fine)	0.6	0.8	0.3	0.7	0.2
(coarse)	0.0	0.2	0.0	0.1	0.0
Total Yield (tons/yr)(fine)	108.7	241.8	58.3	164.3	249.0
(coarse)	7.8	49.6	5.6	30.6	50.8

County, Forest and Private Road Sediment Yield

Watershed	Clarkia-Childs	Childs-Tyson	Tyson-Beaver	Beaver-Alder	Alder-Mouth
Forest road					
Surface fine sediment (tons/yr)	15.0	43.6	6.7	22.0	33.1
Road failure fines (tons/yr) [1]	0.0	0.0	0.0	0.0	24.4
Road failure coarse (tons/yr) [1]	0.0	0.0	0.0	0.0	5.7

Table D-8, continued.

Watershed	Clarkia-Childs	Childs-Tyson	Tyson-Beaver	Beaver-Alder	Alder-Mouth
Encroachment fines (tons/yr) [2]	56.9	109.8	36.6	67.2	75.9
Encroachment coarse (tons/yr) [2]	4.3	28.5	3.5	12.5	17.7
Total fine yield (tons/yr)	71.9	153.4	43.3	89.2	133.3
Total coarse yield (tons/yr)	4.3	28.5	3.5	12.5	23.4
Total sediment (tons/yr)					
Percent fines[3]	0.93	0.794	0.913	0.843	0.811
Percent Coarse	0.07	0.206	0.087	0.157	0.189

[1]Uses mass failure and delivery rates developed from CWE protocol pro-rated for road miles and annualized tons delivered x (road mileage/road mileage assessed)/10 years.
[2]Assume: one -quarter inch from three feet banks; density = 2.6 g/cc.

0.020833	0.25"yr/12"
8098662	Q24*y*5280*28317cc/ft3*2.6 g/cc = g/10 year
9080000	454g/lb* 2000 lb/t*10 year
0.891923	t/mile

[3]From weighted average of fines and stones in soils groups.

Table D-9. St. Maries River immediate watersheds sediment export.

St. Maries River Immediate Watersheds Sediment Export

Watershed	Clarkia-Childs	Childs-Tyson	Tyson-Beaver	Beaver-Alder	Alder-Mouth
Land use fines export (tons/yr)	108.7	241.8	58.3	164.3	249.0
Land use coarse export (tons/yr)	7.8	49.6	5.6	30.6	50.8
Road fines export (tons/yr)	71.9	153.4	43.3	89.2	133.3
Road coarse export (tons/yr)	4.3	28.5	3.5	12.5	23.4
Bank erosion fines (tons/yr)	529.4	452.0	0.0	0.0	0.0
Bank erosion coarse (tons/yr)	39.8	117.3	0.0	0.0	0.0
Total fines export (tons/yr)	710.0	847.2	101.6	253.5	382.3
Total coarse export (tons/yr)	51.9	195.4	9.0	43.1	74.2
Total (tons/yr)	761.9	1042.5	110.6	296.6	456.5
Natural Background	111.5	256.2	62.1	186.9	275.3
Percent Above Background	583.4	307.0	78.0	58.7	65.8

Appendix E

Distribution List

Appendix E. Distribution List

Department of Environmental Quality, State Office

Environmental Protection Agency

St. Joe Watershed Advisory Group (WAG) participants, including:

Name	Affiliation
Mark Addy	Natural Resources Conservation Service
Bob Anderson	Avista Corporation
George Bain	United States Forest Service
Dee Bailey	Coeur d’Alene Tribe
Fred Bear	Idaho Department of Parks and Recreation
Tony Bennett	Idaho Soils Conservation Commission
Lew Brown	Bureau of Land Management
Jack Buell	Benewah County Commissioner
Marti Calabretta	Idaho State Senator
Jon Cantamessa	Shoshone County Commissioner
Jerry Collins	Idaho Conservatoin League
John Ferris	Small Timber Grower
Scott Fields	Coeur d’Alene Tribe
Bob Flagor	Benewah Soil and Water Conservation District/Shoshone Soil and Water Conservation District
Bart Gingerich	Klaveano Ranch
Dolly Hartman	St. Joe Valley Association
Ray Hennekey	Idaho Department of Fish and Game
Dave Johnson	Benewah County Commissioner
Dean Johnson	Idaho Department of Lands
Jim Kingery	University of Idaho
Norm Linton	Potlatch Corporation
Mark Liter	Idaho Department of Fish and Game
Russell Lowry	Citizen
John Macy	United States Forest Service
Bud McCall	Benewah County Commissioner
Jeff McCreary	Ducks Unlimited
Mike Mihelich	Kootenai Environmental Alliance
Alfred Nomee	Coeur d’ Alene Tribe
Steve Osburn	Emerald Creek Garnet
Tasha Ozark	Benewah Soil and Water Conservation District
Dell Rust	Idaho Farm Bureau
Fred Schoenick	Benewah Cattlemen’s Association
Kelly Scott	Benewah Soil and Water Conservation District
Phoebe Shelden	Benewah Soil and Water Conservation District
Neil Smith	Potlatch Corporation
John Straw	Crown Pacific Inland
Greg Tourtlotte	Idaho Department of Fish and Game
Larry Wright	Potlatch Corporation

Appendix F

Public Comments

Appendix F. Public Comments

Table F-1 summarizes the public comments received regarding the St. Maries River Subbasin Assessment and Total Maximum Daily Loads and DEQ's response to these comments.

Table F-1. Public comments and responses to the St. Maries River Subbasin Assessment and Total Maximum Daily Loads.

Source and Comments	DEQ's Response to Comments
Kootenai Environmental Alliance (KEA)	
KEA 1: The final assessment should state how much of the Floodwood State Forest is in the St. Maries Subbasin.	The Floodwood State Forest is wholly contained in the Little North Fork Clearwater Subbasin. It was not deemed necessary to note this fact.
KEA 2: The final assessment should supply data on how much land of the largest three owners/managers is in the rain-on-snow zone.	Since rain-on-snow is a trigger (not a cause of erosion) such information does not appear relevant.
KEA 3: The final assessment and TMDL should supply a detailed assessment of the sediment risk model used by the USFS.	It is not the purpose of the Subbasin Assessment (SBA) or the TMDL to assess the methods not used in the SBA or TMDL. As part of implementation plan development a technical group might want to make the suggested assessment, if the USFS proposed to use the model to assess proposed sediment reductions.
KEA 4: The relationship between CWE analysis of roads and roads in rain-on-snow prone topography is not made in the SBA.	The CWE analysis analyzes the watershed for several factors, among which are the location and condition of roads and sediment yield from those roads or failures to the stream. In all this analysis CWE examines the conditions as they existed when the survey was completed. Rain-on-snow events are transient phenomena that have their genesis most often in the elevation range of 3,300 to 4,500 feet. We know of no direct relationship between CWE and rain-on-snow events. Specifically CWE does not identify roads or other features in this guideline elevation range. Although rain-on-snow events may be a trigger for erosion related to

	roads, the location and condition of the roads and road features as measured by CWE is the primary factor. The watersheds developed under periodic rain-on-snow conditions as a stressor. This has not changed. The placement of roads on the landscape is what has changed.
KEA 5: Road obliteration should be defined.	In earlier documents, road decommissioning was used as the term of choice. This is defined as culvert removal and lay back of slopes at crossings that are part of the active stream channel or expected to be during high discharge conditions and ripping of the road to the first cross drain that vents to forest floor in both directions from that crossing. It does not require total road obliteration. This definition will be placed as a minimum for road removal.
KEA 6: Specific regulations for TMDL monitoring should be stated.	The regulations under which the SBA and TMDLs were developed and implemented are cited in the SBA and TMDLs. If monitoring is not required by these cited regulations it is so stated by inference.
United States Forest Service (USFS)	
USFS 1: Road coverages used are not up to date.	DEQ and Idaho Department of Lands update the roads coverage periodically. In the time frame of SBA development roads coverage may change. This is a mechanical problem. The implementation plan should catch any changes to the positive or negative and credit or delete the analogous loadings accordingly.
USFS 2: Background stream bank erosion measurements have not been made.	Background stream bank erosion has not been accounted for to date. The NRCS is exploring methods for accomplishing this, but to date has found them unsatisfactory. Such background erosion is considered in the basin wide export coefficients.
USFS 3: Temperature standards require revision before 303(d) listings and TMDL development.	The data available in this and other SBAs call the temperature standards into question. This matter was examined by the EPA and three states in EPA Region 10 (Idaho, Oregon, and Washington). The states and EPA did not alter the standard except to add a natural background consideration to it. Thus, the standard remains in place and must

	be addressed by both 303(d) listing and TMDL preparation. The states, including Idaho, are working with the USFS to identify INFISH in forest plans as water quality protection Best Management Practices (BMPs) that include thermal protection. If actions such as INFISH management of a stream are implemented, and the forest plan specifically states that BMPs are in place to meet state water quality standards, and fully meet existing and designated beneficial uses, listing may not be required.
Idaho Department of Lands (IDL)	
IDL 1: The agencies are set up by the temperature standards to fail. The TMDLs will not be achievable or will not achieve the standard.	The temperature standard now has natural background conditions language as a default if the absolute standard cannot be met. Given this language, the temperature TMDLs very quickly point out that stream canopy coverage is the only factor that can reasonably be managed on the landscape and that, on some landscapes, site or vegetation conditions preclude or restrict shading. Thus the TMDLs are designed to provide full shading where this is possible and to identify those areas where less than 100% shading is possible. The state believes these TMDLs will provide thermal protection to the level of natural background. It is possible to manage stream canopy for the goals placed in the temperature TMDLs. Even natural loss of canopy shade can be included as natural background. The state believes these TMDLs are practical and achievable over time.
Coeur d’Alene Tribe (Tribe)	
Tribe 1: Multiple editorial comments.	All editorial comments were noted and corrected as necessary.
Tribe 2: Request addition of scientific names for flora and fauna.	Scientific names were added where requested.
Tribe 3: Is it possible to have a *warm* and heavy snow pack?	The descriptive term “warm” was irrelevant and deleted.
Tribe 4: Are there mountain whitefish in the St. Maries River?	Yes. DEQ BURP data from 1996 show that multiple mountain whitefish were collected by electrofishing the St. Maries River.

Tribe 5: Does the Post Falls Dam influence the lower reaches of the St. Maries River?	DEQ has not determined the effects of the Post Falls Dam on the St. Maries River, and any possible effects appear to be irrelevant in terms of completing the TMDL.
Tribe 6: May want to explain foraging.	The descriptive term "foraging" was irrelevant and deleted.
Tribe 7. Is it necessary that the public know that (county) population is stable?	Yes. Population growth may affect watershed characteristics.
Tribe 8: Data show in Table 8-d is supposed to be collected from 1997 to the present. Why is the data from 1997 not included in the table?	The data collected in 1997 does not measure the same parameters shown in Table 8-d and could not be used to calculate the averages shown in that table. However, the 1997 data is included in Appendix B, Table B-2a.
Tribe 9: Don't believe Alder Creek should be listed as not supporting cold water aquatic life.	This stream will remain listed until conflicting data can be reconciled.
Tribe 10: In Table 16-c what are Highway Miles?	"Highway Miles" refers to total road miles. This term was changed to reflect its meaning.
Tribe 11: Would like a better description of how background sediment delivery is calculated.	This information can be found on pages 61-62.
Tribe 12: In regard to forest regeneration in the St. Maries basin, define "rapidly."	This paragraph has been changed to better reflect DEQ's position on soil erosion following disturbance, while addressing the term "rapidly".
Tribe 13: Would like to assume non-compliance with temperature criteria due to lack of monitoring data.	Non-compliance will not be assumed without sufficient data to support the non-compliance decision. This stream will remain not assessed until sufficient data are procured.
Tribe 14: Please provide further information on the Erosion and Sediment Yield in Channels workshop.	This statement refers to a technical work group made up of members from USFS, BLM, Idaho Department of Fish and Game, Potlach Corporation, The Lands Council, SCC, and chaired by Geoff Harvey, DEQ. The work group developed the sediment model process referred to in Appendix C.